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BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Weapon Systems Overview: A Summary Of Recent GAO Reports, Observations And Recommendations On Major Weapon Systems

This report is a compendium of issues reported and recommendations GAO has made during the past year in 17 reviews of selected weapon system programs. The recommendations, if implemented, would help to minimize development risk and ensure effectiveness, improve disclosure to the Congress, reduce cost, and improve management of programs.



122690

GAO/NSIAD-83-7
SEPTEMBER 30, 1983

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

B-211685

To the President of the Senate and the
Speaker of the House of Representatives

Each year, as part of the work we do in defense acquisitions, we report on issues affecting the development and acquisition of selected weapon systems and make recommendations addressing the issues identified in the reports. This report contains unclassified summaries of 17 selected reports we issued on individual major defense systems, highlights the principal issues that we found, and summarizes our recommendations on these programs.

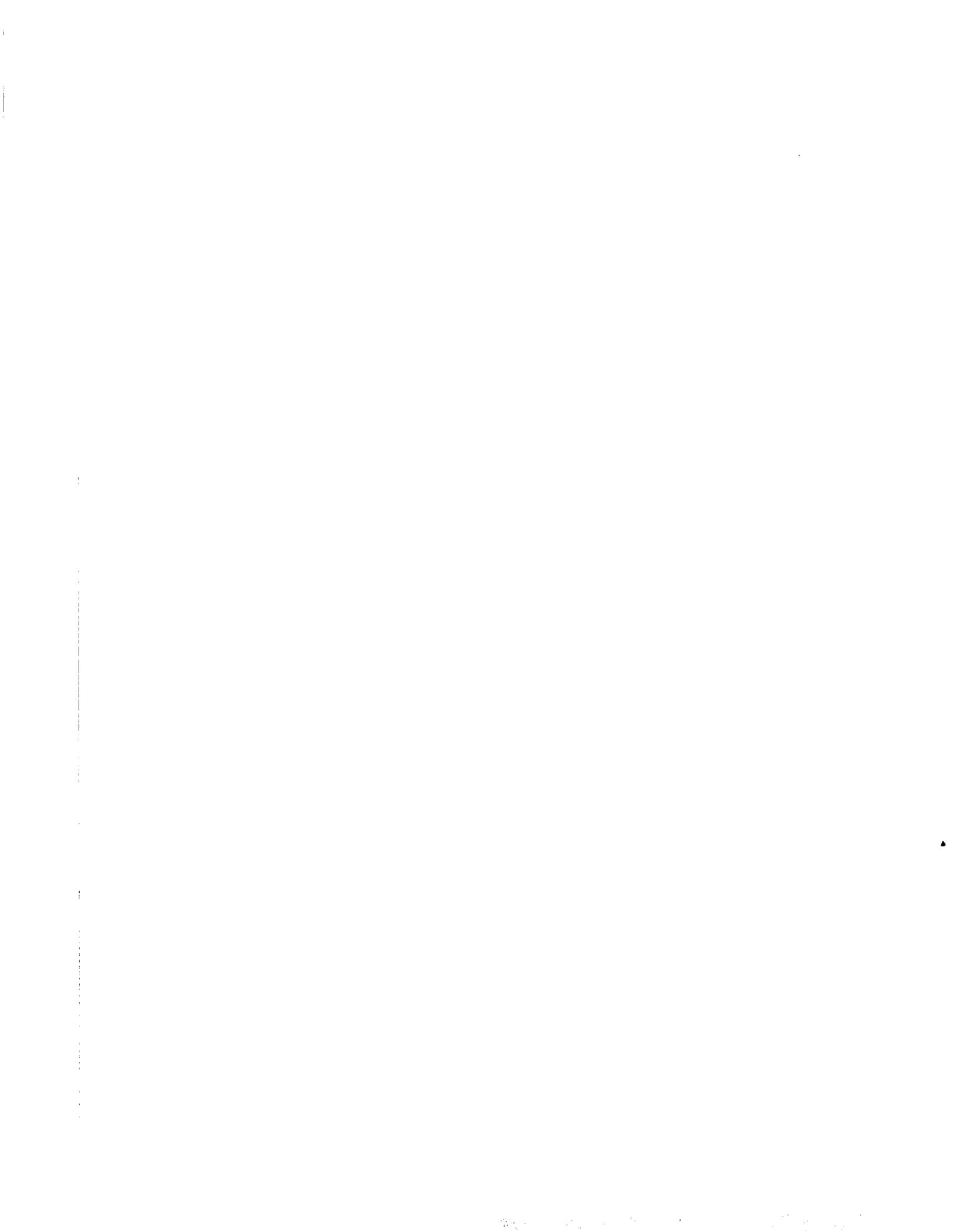
In the reports, we made a number of recommendations to the Congress, the Secretary of Defense, and the secretaries of the military services. The potential impact of these recommendations include minimizing risk and ensuring effectiveness, improving disclosure to the Congress, affirming requirements, evaluating alternatives, reducing cost, and improving program management.

The issues identified in these reports fall into two broad categories. About two-thirds are program acquisition issues requiring management decisions and improvements. The remaining one-third relate to the weapon systems' effectiveness in accomplishing their intended mission. Since the systems are in various stages of the acquisition process, each issue may become more or less serious over time depending on how the Department of Defense chooses to address it.

Appendix I contains a list of other related reports issued between April 1982 and June 1983. Appendix II contains a list of prior years summary reports on major weapon programs.

We are sending copies of this report to interested congressional committees; the Director, Office of Management and Budget; and the Secretary of Defense.


Comptroller General
of the United States



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ABBREVIATION

DOD Department of Defense

CHAPTER 1

INTRODUCTION

Acquiring weapon systems is an expensive, time consuming, and complex process. As each system evolves, it becomes susceptible to unique and unanticipated management, performance, technology, and funding problems. It is important that the Department of Defense (DOD) promptly identify and solve these problems to help ensure an efficiently managed program and an effective system which meets established requirements and goals.

To aid the Congress in its deliberations on the fiscal year 1984 defense budget, we issued, from August 1982 through July 1983, 17 reports on selected weapon systems. In chapter 2, we summarize the potential impact of our recommendations and observations. Chapter 3 categorizes and summarizes the major issues highlighted in each report. In our opinion, these issues could have a direct impact on the systems' efficient acquisition and/or operational effectiveness. These issues formed the bases for our recommendations and observations. Chapters 4 through 7 contain individual report summaries.

The systems which we reviewed and which are included in this overview are:

- AH-64, an advanced attack helicopter with a primary mission to destroy tanks with the laser-guided Hellfire missile.
- Army Helicopter Improvement Program, to provide a capability to overcome engine performance and other deficiencies in existing scout helicopters.
- Patriot, an air defense missile which entered the production phase in 1980. It succeeds Nike Hercules and Improved Hawk.
- Sergeant York, an air defense gun formally called DIVAD (Division Air Defense gun).
- Stinger POST, a portable, shoulder-fired air defense missile.
- S-3A, a carrier-based aircraft designed to protect U.S. surface ships from submarine threats.
- CG-47, a cruiser to provide quick reaction air defense against enemy aircraft and high performance antiship

- missiles. DDG-51, a destroyer intended to be a surface combatant similar to the CG-47.
- Rapidly Deployable Surveillance System, an antisubmarine warfare system being developed as a broad range surveillance sensor which also has tactical applications for observing a smaller ocean area.
 - TOMAHAWK, a family of cruise missiles, the version referred to in this report is the conventionally armed land attack TOMAHAWK cruise missile.
 - F/A-18, a twin-engine, single pilot, aircraft carrier-capable, multimission aircraft.
 - Over-the-Horizon Backscatter radar, to provide a long-range tactical warning capability to help counter a threat of Soviet precursor bomber attack on the continental United States.
 - The antisatellite development program, miniature vehicles, launched from an F-15 aircraft, being developed to counter the Soviet space capabilities.
 - The Wide Area Antiarmor Munitions, a family of weapons to provide the tactical air forces a multiple-kill capability against tanks and other armored vehicles.
 - The B-1B bomber, an aircraft which is a key element of the strategic force modernization program.
 - Light Armored Vehicle, a joint Army and Marine Corps' development of several variants of light armored vehicles.
 - Advanced Medium Range Air-to-Air Missile, to replace the Sparrow missile and to be compatible with the latest Air Force and Navy fighter aircraft.
 - Trainer aircraft, consists of the Navy's proposed T-45 aircraft for its Undergraduate Flight Training System, the Air Force's T-46A Next Generation Trainer, and the Air Force's Tanker-Transport-Bomber Training System aircraft.

Appendix I lists other related reports issued on military acquisitions from April 1982 through June 1983. Appendix II lists other summary reports on major weapon systems issued in previous years.

CHAPTER 2

POTENTIAL IMPACT OF RECOMMENDATIONS AND OBSERVATIONS TO IMPROVE ACQUISITION OF SELECTED WEAPON SYSTEMS

The objectives of our reviews are to recommend ways to promote the efficiency of proposed or ongoing programs, to assist in the process of programs choices, and to make the results of our work known early enough to affect decisions.

In our reviews of 17 selected weapon systems, we made a number of recommendations and observations to the Congress, the Secretary of Defense, and the secretaries of the military services. In our opinion, if action is taken in a timely manner, these recommendations and observations will have a beneficial impact on the programs by contributing to overall improvement in acquiring the weapon systems.

The recommendations were made to promote the economy and efficiency of acquiring the weapon system and to ensure that the desired results and benefits are being achieved. DOD is required by 31 U.S.C. 720 to provide a written response on actions taken on our recommendations. The observations are made to stress certain matters which we believe deserve management attention. DOD is not required by law to respond to observations or suggestions we may make in a report. Both the recommendations and the observations are based on our analysis of the issues discussed in chapter 3.

Summaries of the 17 reports are presented in chapters 4 through 7. For most reports, DOD had not responded with a written statement on actions taken on our recommendations in time to include their statement in this report. Each summary does contain DOD's official oral comments on that report.

AREAS OF IMPACT

This chapter summarizes our recommendations and observations according to their major aim; that is, to (1) affirm requirements, (2) evaluate alternatives, (3) reduce cost, (4) improve program management, (5) improve disclosure to the Congress, and (6) minimize risk and ensure effectiveness. The chart on page 4 depicts the recommendations and observations which follow. Complete recommendations and observations can be found in the individual report summaries. (See chs. 4, 5, 6, and 7.)

Affirm requirements

Establishing clear, specific goals and objectives are essential for successfully initiating, maintaining, and completing any acquisition program. However, as programs

**POTENTIAL IMPACT OF GAO RECOMMENDATIONS AND OBSERVATIONS
ON SELECTED MAJOR WEAPON SYSTEM PROGRAMS**

	AIM OF OUR RECOMMENDATION/OBSERVATION IS TO:					
	AFFIRM REQUIREMENTS	EVALUATE ALTERNATIVES	REDUCE COST	IMPROVE PROGRAM MANAGEMENT	IMPROVE DISCLOSURE TO THE CONGRESS	MINIMIZE RISK/ENSURE EFFECTIVENESS
ARMY PROGRAMS						
AM-64 HELICOPTER/HELLFIRE MISSILE	●					●
ARMY HELICOPTER IMPROVEMENT PROGRAM	● ✓					
PATRIOT				●		●
SERGEANT YORK (DIVAD)				●		●
STINGER POST						●
NAVY PROGRAMS						
S-3A AIRCRAFT	● ✓					●
DDG-51 DESTROYER/CG-47 CRUISER	●	●	●			●
RAPIDLY DEPLOYABLE SURVEILLANCE SYSTEM		●				●
TOMAHAWK CRUISE MISSILE						●
F/A-18 AIRCRAFT					● ✓	
AIR FORCE PROGRAMS						
OVER-THE-HORIZON BACKSCATTER RADAR SYSTEM	●	●				
ANTISATELLITE PROGRAM		●				
WIDE AREA ANTIARMOR MUNITIONS			●			●
B-1 B BOMBER					●	
MULTISERVICE PROGRAMS						
LIGHT ARMORED VEHICLE				● ✓	●	
ADVANCED MEDIUM RANGE AIR-TO-AIR MISSILE			● ✓			
TRAINER AIRCRAFT	●				●	

✓ These items are GAO observations, all others are recommendations.

evolve, some requirements may be affected by changing circumstances, such as the severity of the threat, technological advances or technological setbacks, and demands of other programs. As a result of this dynamic nature of defense programs and the environment in which they are acquired, it often becomes necessary to reassess the programs and adjust their structure, schedule, and funding to more fully maximize their intended benefits or divert their resources into other programs. The specific recommendations or observations we made in the area were:

- Develop firm Hellfire quantity requirements, including those needed for testing and training, and reflect their cost in the total program cost.
- Measure the effectiveness of any improvements in helicopter hovering ability and night operations capability against additional costs, if planned development and operational tests determine the need for such improvements to the Army's Helicopter Improvement Program.
- Decide, between several available options, on how to resolve the shortage of S-3A aircraft which will intensify when the two new aircraft carriers are introduced into the fleet.
- Determine whether planned incremental improvement to mission capability offsets the detrimental effects on the CG-47's speed and stability before adding lower priority systems.
- Reassess the need and justify the decision to acquire the Over-the-Horizon Backscatter radar system considering the threat and alternatives to the system.
- Consider extending the use of existing aircraft in lieu of procuring the Navy's T-45 trainer aircraft until it has been made carrier capable.

Evaluate alternatives

An individual weapon system is not developed in a vacuum. To ensure that the system is the best and most cost-effective solution to a mission need or requirement, there is a need throughout the acquisition process to explore and evaluate attractive alternatives to systems and actions currently planned. In our opinion, there are possible opportunities to identify less costly and/or more effective alternatives to existing plans. The specific recommendations made were:

- Consider the alternative of buying additional CG-47s if DDG-51 cost targets cannot be met or it becomes necessary to significantly reduce the combat capability to meet the cost targets.
- Reassess the benefits of producing the Rapidly Deployable Surveillance System Mod O in relation to alternatives, specifically the complete surveillance system or a long-life sonobuoy now under development.
- Reassess the Over-the-Horizon Backscatter radar system in relation to alternatives, including tactical warning systems being developed and the use of existing airborne warning assets.
- Consider alternatives to the antisatellite program's air-launched miniature vehicle before the miniature vehicle enters production.

Reduce costs

The rising cost of acquiring weapon systems requires that increased attention be directed at identifying opportunities for reducing development and acquisition costs. We have made specific recommendations concerning management actions which could reduce, minimize, or avoid increases to program costs. Other recommendations and observations, especially some of those in the areas of minimizing risk, affirming requirements, evaluating alternatives, and improving program management, also have a secondary benefit of ensuring more affordable systems. The specific recommendations or observations made were:

- Discontinue the acquisition of the SPS-49 radar for future CG-47 ships because it is not essential to mission performance.¹ Also, reduce the cost of the DDG-51 to make the Navy's anti-air requirements affordable.
- Terminate the Wide Area Antiarmor Cluster Munition system because it does not meet minimum requirements.²

¹This recommendation was also made in our report C-MASAD-81-8, dated 2/19/81. The House Appropriations Committee deleted \$17 million from the fiscal year 1982 budget for the SPS-49 radar. Notwithstanding, Navy officials plan to install the SPS-49 radar because they believe a backup system is needed and the necessary funds could be redirected from other cruiser accounts.

²DOD agreed with this recommendation and has terminated the Antiarmor Cluster Munition.

- Determine that those Advanced Medium Range Air-to-Air Missile related capabilities which have only marginal usefulness in combat are cost effective.

Improve program management

Because of large resource requirements, high technological content, and importance to an agency mission, system acquisition programs require that an effective management structure be established that will efficiently and effectively accomplish program objectives. Although on two programs, the AH-64 and the Army Helicopter Improvement Program, we made specific favorable comments on certain aspects of program management, we have made recommendations and observations which are directed at improving the overall management of other programs. Specifically:

- Negotiate fixed-price contracts for future Patriot production under which the contractor would assume a share of the cost risk.
- Refrain from again prescribing or endorsing the acquisition strategy followed in the Sergeant York program until its benefits can be evaluated.
- Review periodically acquisition plans for the Light Armored Vehicle to ensure they are conforming to the intent of the Congress and the objectives of the joint program.

Improve disclosure to the Congress

Since the Congress has to make decisions and allocate national resources among government programs, it is essential that the most accurate and complete information available be provided by DOD on the cost, schedule, and performance of weapon systems. Specifically:

- Consider legislative and/or administrative actions to prevent funding practices used in the F/A-18 program.
- Identify and provide all B-1B acquisition costs to the Congress in one package.
- Place the Light Armored Vehicle program under the Selected Acquisition Reporting system to ensure that its progress can be closely followed by the Office of the Secretary of Defense as well as the Congress.³
- Provide a firm program plan which discloses the uncertainties, risks, and judgment factors involved in determining the quantity of T-45 trainer aircraft to be

³Based on our recommendation, DOD commenced Selected Acquisition Reporting as of the quarter ending December 31, 1982.

procured, the procurement schedule, and the funding requirements.

Minimize risk and ensure effectiveness

Many of our recommendations and observations are intended to minimize the risks of acquiring the systems and to ensure the effectiveness of the deployed system. While we recognize that it is unrealistic to expect to resolve all problems and uncertainties, experience has shown that problems which go unresolved often lead to problems in later acquisition phases and with the deployed systems. By resolving most of the problems as soon as possible, we believe that many future problems, including operational and support problems, can be avoided leading to improved weapon system capability and readiness. These recommendations involve withholding funds and approvals until certain conditions have been met which minimize the risks associated with proceeding and help ensure eventual system effectiveness. Specifically:

- Delay approval for an increase in the number of AH-64 helicopters and higher production rates for the AH-64 and Hellfire missile until sufficient actual production experience permits establishing a credible program cost estimate, the production capabilities have been demonstrated, and technical problems overcome. Also, conduct and evaluate realistic operational testing of the automatic test station.
- Do not permit fiscal year 1983 funds to be applied toward an increase on the Patriot production rate until production tests have shown that deficiencies have been corrected.
- Require a formalized assessment and review by the project manager on the progress of contractor reliability and maintainability tests before exercising the second production option of the Sergeant York. Station some of the Sergeant York test equipment in the direct support area where it can be proven out before making a final decision on its location.
- Determine that satisfactory progress has been made toward resolving the production problems before committing the Stinger POST to full-scale production. Also, assess the desirability of accelerating proposed Stinger POST improvement programs.
- Delay future funding of the S-3A improvement program until there is an assessment and assurance that the

operational readiness goals will be attained or, if not attainable, that the mission capability can be met with lesser performance.

- Do not approve development of a target for the CG-47/AEGIS weapon system until there is assurance that the proposed targets will meet testing requirements.
- Reassess the Rapidly Deployable Surveillance System and make future funding for either of the two versions dependent upon the reassessment.
- Limit the acquisition of TOMAHAWK cruise missiles to the 44 already funded until an effective terminal maneuver capability can be demonstrated.
- Validate critical technology and demonstrate operationally effective delivery concepts before making major commitments of funds for the Extended Range and Wasp Wide Area Antiarmor Munitions.

CHAPTER 3

ISSUES AFFECTING THE ACQUISITION OF SELECTED WEAPON SYSTEMS

The recommendations and observations discussed in chapter 2 were made to provide solutions to the issues we identified in our reports. Here we have summarized these issues into two broad areas--weapon systems' effectiveness and management of the weapon systems acquisition program--and into 14 specific categories which have a direct bearing on the success of the program. These issues, displayed on a chart on page 11, are not intended to represent all the problems or questions associated with the programs reviewed. Many factors will determine what areas of the program we will concentrate our efforts on during any given review. Also, the issue categories should not be considered independently. Many of the categories are closely related, and some identified problems could even affect several categories. Our work on individual weapon systems is designed to highlight key issues as the programs mature. Since these systems are in various stages of the acquisition process, each issue may become more or less serious over time depending on how and when DOD chooses to address it. Details on these issues can be found in the summaries in chapters 4, 5, 6, and 7, or in the full reports.

ISSUES AFFECTING SYSTEM EFFECTIVENESS

System effectiveness addresses the capability and readiness of the systems to meet the mission requirements. These issues fall into five categories: operational or performance limitations; logistics support; operational requirements; reliability, maintainability, and availability; and force level requirements.

Operational or performance limitations

Operational or performance limitations refer to those factors which restrict a weapon system from functioning as designed or expected within its threat environment. Our reviews found that some weapon systems or subsystems may not meet their originally established performance goals or fulfill user needs. Specifically:

- In the Army Helicopter Improvement Program, there is concern about the helicopter's ability to maintain a hovering position and its compatibility for night operations with the AH-64 attack helicopter.
- While the Patriot's overall performance has improved, its performance in certain combat environments could still be degraded; improvements are planned.
- Although Stinger POST surpasses the existing Stinger in performance, certain limitations exist for which the Army is planning improvements.

ISSUES ASSOCIATED WITH SELECTED MAJOR WEAPON SYSTEM PROGRAMS

	SYSTEM EFFECTIVENESS										PROGRAM ACQUISITION									
	OPERATIONAL SUPPORT	LOGISTICS SUPPORT	OPERATIONAL READINESS	AVAILABILITY	RELIABILITY	MAINTAINABILITY	LOG LEVEL	COMPLETION	TECHNICAL AFFORDABILITY	GOVT EFFECTIVENESS	ACQUISITION COST	PRODUCTION COST	TECHNICAL AFFORDABILITY	MANAGEMENT	CONDUCT	COMPLETION	PRODUCTION COST			
ARMY PROGRAMS																				
AH-64 HELICOPTER/ HELIXRE MISSILE																				
ARMY HELICOPTER IMPROVEMENT PROGRAM																				
PATRIOT																				
SERGEANT YORK (OVAD)																				
STINGER POST																				
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AIR FORCE PROGRAMS																				
OVER-THE-HORIZON BACKSCATTER RADAR SYSTEM																				
ANTISATELLITE PROGRAM																				
WIDE AREA ANTI-AIRBORNE MUNITIONS																				
B-1B BOMBER																				
MULTISERVICE PROGRAMS																				
LIGHT ARMORED VEHICLE																				
ADVANCED MEDIUM RANGE AIR-TO-AIR MISSILE																				
TRAINER AIRCRAFT																				
NUMBER OF ISSUES	8	4	6	2	3	10	4	3	3	5	6	4	1	1	2					
PERCENTAGE OF TOTAL ISSUES	23/61 = 38%										38/61 = 62%									

● ISSUES ADVERSELY AFFECTING PROGRAM

- The CG-47's displacement and center of gravity do not meet design goals, which could have an adverse effect on the ship's speed and stability.
- As a deployed system, the Rapidly Deployable Surveillance System Mod O's contribution to future strategic surveillance of enemy submarines or cost effectiveness in tactical applications is questionable.
- The TOMAHAWK conventionally armed land attack warhead cruise missile has not demonstrated an effective terminal maneuver capability.
- The range of the F/A-18 still appears to be a problem. Also, effective deployment is dependent on a new generation electronic warfare system.
- The Extended Range and Wasp Wide Area Antiarmor Munitions involve operational techniques that have not been demonstrated.

Logistics support

Weapon systems depend on logistics support, an integral part of a system's acquisition and operation, to create and sustain their effectiveness. Insufficient attention to logistics support in the early phases of the acquisition can lead to problems when the system is fielded. We identified instances where the planned logistics may not meet system availability or war-time usage requirements. Specifically:

- The fault detection system in the AH-64 has not been thoroughly tested and the ground test station has not been tested for its reliability in a field environment.
- Improvements to the Patriot's maintenance software are needed before the system can be adequately supported in the field.
- Sophisticated and unproven field maintenance test sets for the Sergeant York should be tested in the forward, direct support area before new maintenance concepts are formulated.
- The unavailability of essential equipment and delays in the logistic support program may impede the F/A-18's operational effectiveness.

Operational requirements

Operational requirements designated for a weapon system are those approved characteristics considered necessary for the

system to meet a needed defense capability. These requirements should be defined before beginning development work but may be frequently modified as directed from development results or changes in the threat or mission need. Issues arose where the precise role of the system or proposed requirements were questioned or not firmly established, in most instances, casting doubt on the weapon's ability to meet the needed defense capability. Specifically:

--The Navy has not demonstrated that the CG-47's SPS-49 radar is essential to mission performance. It should not be purchased.¹

--Considering the threat described in intelligence reports and the alternatives to the radar system, the acquisition of the Over-the-Horizon Backscatter radar system as now planned is questionable.

--DOD did not evaluate the antisatellite weapon system's performance against the current Joint Chiefs of Staff's antisatellite requirements.

--Almost from the beginning the Light Armored Vehicle program has been marked by indecision as to the types of vehicles that would best suit the services' needs.

--Studies of operational usefulness for the Advanced Medium Range Air-to-Air Missile suggest that some of the missile-related capabilities may have only marginal usefulness.

--The Navy may not need the T-45 trainer aircraft before 1990. If so, it would make it possible to avoid buying the noncarrier-capable version which could be available starting in 1987 and allow the Navy to wait for the carrier-capable version available in 1990.

Reliability, maintainability, and availability

Reliability, maintainability, and availability levels affect the readiness, mission capability, and sustainability of a weapon system. Reliability is commonly expressed as the probability that a system will function as intended for a period of time under stated conditions. Maintainability is the ability of the system to be retained or restored to a specific level of performance within a given time. Availability is the degree to which a weapon system is in an operational state of readiness to perform its mission and therefore, capable of being committed to battle at any time.

¹The Navy appears to be purchasing the radar anyway. (See footnote 1, p. 6.)

- Our review of the S-3A aircraft program has shown that S-3A's poor operational readiness has been caused by low equipment reliability and maintainability; thus, its availability to perform its mission has been limited.
- The lack of success, historically, with built-in test systems and the unsuccessful performance of such a system for the B-1A, raises concerns about the successful performance of the built-in test equipment for the B-1B.

Force level requirements

Force level requirements refer to those quantities of a weapon system necessary to carry out the objectives of a mission need, as determined by specific military and/or political requirements. Specifically:

- The quantity of Hellfire missiles is likely to increase again because consumption rates are likely to be higher than anticipated in the AH-64/Hellfire missile program.
- The Navy has enough S-3As for current active squadrons, but not enough for attrition and reserve squadrons; the shortage will intensify when the two new aircraft carriers are introduced into the fleet.
- A Marine Corps requirement for the Light Armored Vehicle is that it be liftable by the CH-53E helicopter. However, it is doubtful that there will be sufficient numbers of helicopters available to meet lift requirements unless the Marines procure additional helicopters over those planned.

ISSUES AFFECTING PROGRAM ACQUISITION

Categories affecting program acquisition are affordability, technical risk, cost effectiveness, incomplete data reporting, adequacy of testing, program management, program concurrency, timeliness, and production readiness.

Affordability

Affordability encompasses the availability of sufficient fiscal resources to effectively and efficiently support weapon system acquisitions. This is an area we have placed more emphasis on in recent years as many of the programs initiated in the 1970s transition into production and become operational. We identified significant cost growth as well as uncertain or incomplete program cost that raise questions concerning the continued availability of program funds and could, in some

instances, also disrupt the procurement expectations in other programs. Such growth and uncertainty often result in compromises in the military requirements of the system, delays in fielding other new equipment, longer acquisition cycles, equipment inventory shortages, and inefficient rates of production. Specifically:

- Significant cost growth has resulted in decreases in the number of AH-64 helicopters to be procured.
- The cost of the Army Helicopter Improvement Program has more than doubled; additional increases can be anticipated because its capabilities have not been demonstrated and because of program uncertainties.
- Some of the same factors which have caused Patriot cost to nearly double in the last 2-1/2 years are still present, making further cost increases likely; therefore, available funding may not be sufficient to maintain the planned procurement schedule.
- The estimated cost of the DDG-51 destroyer has increased to the point where the Chief of Naval Operations has said the design proposed is not affordable and is not a lower cost alternative to the CG-47 as the Navy had intended.
- The Rapidly Deployable Surveillance System program was separated into two versions--a near term (Mod 0) and a far term (Mod 1) because of the high costs associated with the latter.
- The antisatellite weapon system was envisioned as a relatively inexpensive--about \$3.6 billion--quick way to meet mission requirements, but it has become more complex and costly than originally envisioned, potentially costing in the tens of billions of dollars.
- Extended Range and Wasp Wide Area Antiarmor Munitions will cost \$6.3 billion more than initially expected.
- Objectives of the Light Armored Vehicle program include acquiring low-cost basically similar vehicles for use by the Army and the Marine Corps. With the choices of several variants in the program still being considered for acquisition, the program may be reaching the level where its affordability should be questioned.
- The Advanced Medium Range Air-to-Air Missile acquisition cost has more than tripled since concept validation began 3-1/2 years ago; this does not include some known elements which could add significantly to the costs.

--The Navy had not decided on the structure of the T-45 trainer aircraft program and had no cost estimate that was satisfactory for budget purposes. The cost estimate for the Air Force's T-46A trainer aircraft was reduced by putting some costs in another program, deleting some work, and excluding potential future costs.

Technical risk

With the highly sophisticated, complex weapon systems being fielded today, it is not unusual to encounter technical risks during acquisition. Technical risks are those problems and uncertainties that may hinder achievement of design and development goals of a weapon system. If these matters are not resolved, they could have major impacts on program cost, schedule, and ultimate performance. Specifically:

- The mast-mounted sight being developed for the Army Helicopter Improvement Program employs relatively advanced technology causing risk and uncertainty in development and testing.
- The Rapidly Deployable Surveillance System's new mooring cable has yet to be tested in its proposed environment and its effect on system reliability is a high-risk item.
- The Extended Range and Wasp Wide Area Antiarmor Munitions rely on high-risk technology and involve new unproven operational concepts.
- The development time being scheduled for the high-performance engine for the Air Force's T-46A trainer aircraft may be too short given the history of problems with engine development programs.

Cost effectiveness

In acquiring weapon systems, a cost-effective balance must be achieved among acquisition costs, ownership costs, and a system's effectiveness in meeting its mission requirements. Alternatives or options to be evaluated include management actions, equipment, weapon systems, and support systems. Questions arise when the options being pursued do not appear to be the most effective for the least cost. Specifically:

- Alternatives exist to the Rapidly Deployable Surveillance System Mod 0, such as the far term Mod 1, which should be considered before making the production decision.

--The potential for and the cost effectiveness of using existing airborne warning systems to strengthen surveillance coverage against a surprise bomber attack should be considered, along with other factors, until a more durable system than the Over-the-Horizon Backscatter radar system can be deployed.

--Alternatives to the miniature vehicle of the antisatellite weapon system program are feasible, and their cost effectiveness to meet mission requirements should be considered.

Incomplete data reporting

It is essential that accurate and informative data on the status and progress of major weapon system programs be made available to the Congress and DOD's top-level management in order for them to make informed decisions. Incomplete, misleading, or inaccurate status reporting could result in congressional and DOD decisions that would not otherwise be made. Specifically:

--To cover cost growth on the F/A-18, the Navy employed a series of budgetary and funding practices which caused congressional concern regarding oversight and the use of appropriated funds as the Congress intended.

--Excluded cost items from the B-1B program estimates obscure congressional visibility of the acquisition costs, could cloud the funding process, and could unintentionally affect the time phasing of funds later on in the aircraft acquisition.

--The Light Armored Vehicle program was not in the Selected Acquisition Reporting system. Such reporting would focus management attention to help ensure that the program actions are conforming to the intent of the Congress and the objectives of the joint program.²

Adequacy of testing

The adequacy of testing during weapon system acquisition is a matter of serious concern. Tests are conducted to identify problem areas and risks which must be corrected or reduced in order to minimize uncertainties that could adversely affect the system's effectiveness, cost, or availability for deployment. Specifically:

²Selected Acquisition Reporting commenced at the quarter ending December 31, 1982. (See footnote 3, p. 7.)

- The results of ongoing tests of initial production units and the operational tests which follow will not be available before the scheduled decision on increasing the present production rate of the Patriot.
- Government reliability, maintainability, and availability testing on the Sergeant York was canceled because the prototype was deemed unsuitable for testing and the testing will not be done until production is underway.
- The AEGIS combat system for the CG-47 was not fully tested against certain enemy threats before it was commissioned in January 1983.
- Time available for flight testing the B-1B before the initial operational capability date is limited. This especially affects the new defensive avionics.
- Incomplete validation phase tests on the Advanced Medium Range Air-to-Air Missile means that some critical issues and technical characteristics have not been fully demonstrated.

Program management

Program management involves the continuing actions of planning, organizing, directing, coordinating, controlling, and evaluating the use of money, materials, staff, and facilities to field an effective and supportable system. We specifically addressed program management in the following programs:

- A fixed-price contract, instead of a cost-plus incentive fee should be awarded for the Patriot because the design has stabilized sufficiently to allow the contractor to absorb some of the risk.
- The acquisition strategy for the Sergeant York places greater priority on adhering to the schedule than to correcting some serious system performance problems.
- Instead of starting production of the Rapidly Deployable Surveillance System (Mod 0) for use in a surveillance role, the Navy may want to work toward developing and producing the complete surveillance system.
- The Air Force plans to request multiyear contract authority for the B-1B to keep acquisition costs down but has not demonstrated that it meets the multiyear contracting criteria.

- The validation phase schedule for the Advanced Medium Range Air-to-Air Missile proved to be unrealistic, and the full-scale development schedule seems to be no less ambitious.
- Although the Congress has stressed the desirability of having trainer aircraft which meet the needs of both the Air Force and the Navy, there is little likelihood that either service will procure the other's trainer aircraft at this time.

Program concurrency

Program concurrency occurs when production begins before development is complete and the system is approved for service use. In the absence of an overriding immediate military need, concurrency is generally undesirable because it could increase the degree of program risk and result in higher costs and lower performance. We raised the question of undesirable program concurrency in the following programs:

- Certain important development and test and evaluation activities for the AH-64 and Hellfire will not be completed until after initial production has begun.
- Air Force development test and evaluation of the first Over-the-Horizon Backscatter radar system is not to begin until production is far advanced.
- Full-scale development testing of the Advance Medium Range Air-to-Air Missile is scheduled to continue well beyond the initial commitment to production; thus, demonstration of the missile's total performance will not be known.
- There is considerable overlap between development and production of the Air Force's T-46A trainer aircraft program.

Timeliness

An objective of any system's acquisition is to have an operational system fielded within the time dictated by the need or threat. We found that the CH-53E helicopters, required to airlift the Marine Corps Light Armored Vehicles, may not be available until 3 years after the Light Armored Vehicle deployment.

Production readiness

Production readiness of a system rests on the assurance that the final design and the necessary managerial and physical

preparation for initiating and sustaining a viable production effort will support a production commitment. An inappropriate production readiness decision can lead to unacceptable risks to a program's schedule, performance, or cost and can seriously affect the quality and adequacy of the production unit. We questioned the production readiness of two programs:

- Although important progress has been made, there are still uncertainties and risks with the production of the AH-64 and Hellfire to be overcome by the prime contractors.³
- Production uncertainties exist in manufacturing the ultraviolet detector and other critical seeker components in sufficient quantities for high-rate production of the Stinger POST.

³Follow-up work since this report was issued has shown that the Army and the contractors have made substantial progress in overcoming production uncertainties. (GAO/NSIAD-83-4, June 27, 1983.)

CHAPTER 4

SUMMARIES OF SELECTED ARMY WEAPON SYSTEM REPORTS

THE ARMY'S AH-64 HELICOPTER AND HELLFIRE

MISSILE RETAIN RISKS AS THEY ENTER PRODUCTION



SOURCE: U.S. ARMY

ISSUES

*Logistics support • Force level requirements
Affordability • Program concurrency
Production readiness*

The Army's AH-64 advanced attack helicopter and Hellfire missile are now at a critical juncture--the transition from development into production. The AH-64's primary mission is to kill tanks with the laser-guided Hellfire. The helicopter's affordability was questioned in the Congress during the fiscal year 1983 budget hearings and is likely to undergo careful scrutiny again as future production increments are considered for funding.

There are no indications at this time that either the AH-64 or Hellfire programs should not continue on their present schedules. Some aspects of both programs, however, bear watching if they are to continue the progress they have made in the past year. The programs have benefited from the close personal attention of the Under Secretary of the Army, particularly through his efforts to contain cost growth and to oversee areas of production where uncertainties remain.

GAO/C-MASAD-83-9
JANUARY 26, 1983

Essentially, the uncertainties are of two types. The principal contractors must overcome formidable production hurdles. Also, the government must complete testing and evaluation to verify the success of modifications made to certain critical components which earlier had exhibited some performance problems.

GAO undertook this review to evaluate the risks still facing the AH-64 and Hellfire upon entering production and the progress the Department of Defense has made in addressing these risks.

PRODUCTION UNCERTAINTIES REMAIN
IN BOTH PROGRAMS

The prospects for producing the AH-64 and Hellfire within projected costs and schedules will become more evident once early production experience is obtained. At present, there are several unknowns. Hughes Helicopters, Incorporated, the AH-64 prime contractor, is faced with starting up a new assembly plant in Mesa, Arizona, and must manage the flow of sophisticated aircraft components from the many subcontractors to the new plant. This must be accomplished against the background of the contractor's tight cash flow position. Hellfire has some production uncertainties as well.

Martin Marietta Aerospace, which will produce the Hellfire seeker, planned to capitalize on its production experience with the seeker for the laser-guided Copperhead projectile since the Hellfire seeker will be produced in the same facilities. However, the contractor ran into serious problems in producing the Copperhead seeker, and that program has been terminated.^{1/}

Defense officials have closely managed the production aspects of both programs as these uncertainties have become better understood. Indeed, important progress has been made during the past year. Hughes Helicopters reports that construction of the new facility is 2 months

^{1/}Since this report was issued, the Copperhead program has been reinstated, and the Army has again included it as a line item in its fiscal year 1984 budget.

ahead of schedule and that the firm has had no difficulty in hiring the skilled people needed for the facility. Martin Marietta officials are confident they can correct the problems experienced with Copperhead and they have located a management team at the Hellfire seeker production facility to ensure that Hellfire's production goes smoother.

ARMY CONSIDERS PROVISION FOR
PRODUCTION RISKS UNNECESSARY

AH-64 costs have increased substantially since September 1981 when the procurement of 536 helicopters was estimated to cost \$4.8 billion, or \$9 million per unit. Because of these increases, which raised some doubts in the Congress as to the weapon's affordability, the Army reduced the number of helicopters to be procured from 536 to 446. Procurement costs for 446 helicopters are now estimated to be \$6.15 billion, or \$13.8 million per unit.

Included in this estimate is \$528 million the Army added to cover potential production risks.

In March 1982 the Army decided that based on successful price negotiations with the AH-64 prime contractor for the first increment to be purchased, the \$528 million of production risk money was not needed to cover the balance of the production run. Instead, the Army plans to use this money to buy more AH-64s, subject to congressional approval.

DEVELOPMENT EFFORTS WILL CONTINUE
CONCURRENT WITH INITIAL PRODUCTION

Several important tests and evaluations to prove out new or redesigned components on the AH-64 and Hellfire will not be completed until after initial production has begun. The November 1982 flight test results of the AH-64's modified target acquisition and designation sight are still being analyzed. Additional flight testing is scheduled in early 1983 to evaluate the performance of the sight's newly redesigned electrical components. Of several planned Hellfire modifications, perhaps the most significant is the development of a new motor which will generate less smoke than the current motor.

ADDITIONAL QUANTITIES OF
HELLFIRE BEING CONSIDERED

In December 1981 the Army reported that it planned to increase Hellfire quantities from 24,600 missiles to 35,756 missiles, increasing total estimated procurement costs to \$1.71 billion. Quantities of missiles to be procured are likely to increase further since the current quantity excludes approximately 10,000 missiles needed for testing and training and because missile consumption rates have been shown in recent studies to be higher than anticipated.

KEY QUESTIONS TO BE ANSWERED
REGARDING LOGISTIC SUPPORTABILITY

High operational availability for the AH-64 will depend on how well the aircraft's onboard fault detection system and ground test station can isolate faulty components and subcomponents for removal and replacement. The fault detection system has yet to be thoroughly tested with all sections of the aircraft. The main question concerning the test station is whether it can operate practically and reliably in a field environment.

RECOMMENDATIONS

In view of the production uncertainties and tests and evaluations that remain and the possibility that further program cost growth may not be avoidable, GAO recommends that the Secretary of Defense withhold approval for a program quantity increase above the currently planned procurement of 446 AH-64 aircraft. The Secretary should wait until sufficient actual production experience permits establishing a credible program cost estimate and a conclusive determination is made that the risk money will not be needed for contingencies. GAO believes this determination will be possible before the first production increment is completed.

GAO also recommends that the Secretary of Defense, before approving future funding requests for higher production rates of the AH-64 and Hellfire, weigh the progress made in demonstrating production capabilities and overcoming technical problems.

GAO further recommends that the Secretary of Defense direct the Army to

--develop firm Hellfire quantity requirements, including those needed for testing and training, and have their cost reflected in the total program cost and

--have an Army test and evaluation agency conduct realistic operational testing of the automatic test station and evaluate the results before its fielding.

AGENCY AND CONTRACTOR COMMENTS

The Department of Defense provided GAO with official oral comments. Defense officials believe production and development risks in both programs to be small. Consequently, they maintain that the money set aside for production contingencies is no longer needed for that purpose.

Two prime contractors also commented on the report. Hughes Helicopters officials stated that regarding the tight cash flow situation, they have increased available funds through additional credit. Also, they noted that the drop in the prime lending rate should ease cash flow requirements. Martin Marietta officials stated that while Hellfire is a more sophisticated system than Copperhead, it should be easier to rework on the production line. Thus, they believe they can largely prevent the production bottlenecks that Copperhead experienced.

Whether the AH-64 and Hellfire can be produced for the costs and within the schedules now being projected requires, in GAO's opinion, some production experience sufficient to demonstrate the contractors' production capabilities. Consequently, GAO believes that the \$528 million set aside for production contingencies should be retained for that purpose and should not be used to procure additional aircraft until cost and schedule projections can be made based on demonstrated performance.

ARMY HELICOPTER IMPROVEMENT PROGRAM'S FUTURE

MAY DEPEND ON SUCCESS IN CONTROLLING COST



SOURCE: U.S. ARMY

ISSUES

*Operational/performance limitations • Affordability
Technical risk*

If successfully developed, the Army's Helicopter Improvement Program will provide a capability to overcome major deficiencies in existing scout helicopters. However, the program's cost growth has been dramatic, its cost having more than doubled in less than 3 years from an initial estimate in February 1980 of \$1.3 billion to a current estimate of \$2.7 billion. The program is still in the early stage of development. So far, the helicopter's capabilities have not been tested and demonstrated. Coupled with other uncertainties that exist in the program, some additional cost increases can be anticipated.

How well the Army can control the program's cost is likely to determine its future. Because of congressional displeasure with their high cost, past Army efforts to develop a new scout helicopter were halted early in development.

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The new helicopter is to be capable of acquiring and designating targets for the attack helicopter not only in daylight, but also at night and in periods of limited visibility, things the current helicopter cannot do. A sight mounted outside the aircraft above the main rotor, equipped with a television, infrared sensors, and a laser designator, is to provide the helicopter the capability to view and designate targets with only the sphere which houses the sight exposed.

PROGRAM EXHIBITS A RELATIVELY CONSERVATIVE ACQUISITION STRATEGY

Certain aspects of the helicopter program offer the promise that it may survive where previous efforts to develop a scout failed. The scout helicopter is not a completely new development but, rather, a modification of an existing helicopter, the Army's OH-58. Also, unlike several other current Army weapon system acquisitions, the program's milestones show an orderly and moderately paced progression towards large-scale production.

The milestones allow for a 41-month, full-scale engineering development program. They provide for completing development testing and for flight testing its most critical component, the mast-mounted sight, before the helicopter begins production. Although most operational testing will not have been accomplished before the first production option is to be exercised, only 16 of the programmed 578 helicopters will have entered production before a full-scale production decision is due in April 1985. The second production option, for 44 aircraft, is not due to be exercised until 9 months after testing is completed, leaving ample time for the results to be evaluated and reported.

SOME PROGRAM RISKS AND UNCERTAINTIES EXIST

The helicopter program is not without some risk and uncertainty. The most important among these is developing and testing the mast-mounted sight, a component employing relatively advanced technology. Other concerns involve the pilot's ability to maintain the aircraft's hovering position and the aircraft's compatibility for

night operations with the Apache attack helicopter, for which it is to designate targets. The attack helicopter has a superior night vision capability. These concerns should be addressed in the development and operational tests which are to begin July 1984 and end January 1985.

The helicopter program has not advanced sufficiently to permit an assessment of its potential. The first definitive indications of its progress will not appear until development and operational tests begin in July 1984. Therefore, GAO is not making any recommendations now.

AGENCY COMMENTS

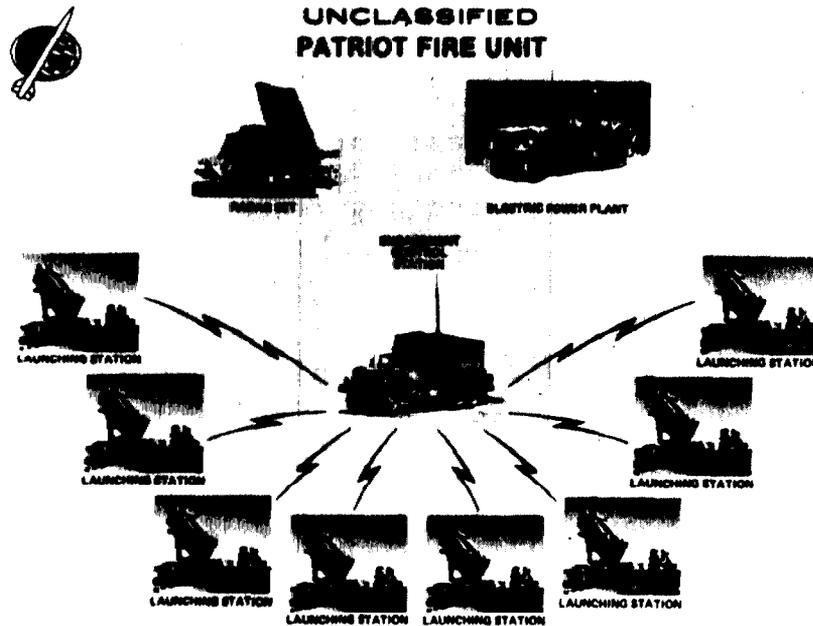
Defense officials said the initial \$1.3 billion planning estimate should not be given too much credence. They explained the large program cost increase as due to the planning estimate having been made when the helicopter's configuration had not been fully defined.

Defense officials added that improvements to the helicopter's night vision and hovering will be considered for procurement after the aircraft's performance is assessed in development and operational testing. They believe adopting a pilot night vision system similar to the one incorporated in the Apache may not be warranted by the additional cost and weight this would entail.

GAO believes the original cost estimate was very significant given the repeated congressional objections to the high cost of earlier scout helicopter starts. GAO attaches particular importance to the forthcoming development and operational tests where the helicopter's performance without the improvements will be demonstrated. If the tests show a need for the improvements, the effectiveness they could provide will have to be measured against the increased cost they would entail.

GAO performed this review to provide the Congress with the status of the program before it begins to evaluate the Army's fiscal year 1984 request for funds to finance the helicopter's continuing development.

RESULTS OF PRODUCTION TESTING SHOULD
BE CONSIDERED BEFORE INCREASING PATRIOT'S PRODUCTION



SOURCE: U.S. ARMY

ISSUES

*Operational/performance limitations • Logistics support
Affordability • Adequacy of testing
Program management*

Test results to date provide a basis for optimism about the Patriot air defense system's ultimate performance capabilities. Problems disclosed in earlier testing have kept the system in low-rate production for 3 years. For fiscal year 1983 the Congress approved the Department of Defense request to increase Patriot's production from the previous 9 fire units and 176 missiles to 12 fire units and 376 missiles. The Army plans to request additional production increases in its fiscal year 1984 budget. GAO believes that increases in the production rate above the present level of nine fire units should await the results of ongoing tests of initial production units, and the operational tests to follow, which are scheduled to be completed in August 1983. The operational tests will be conducted with production hardware and user personnel under combat conditions. Only prototype models have been tested previously.

GAO/C-MASAD-83-7
JANUARY 26, 1983

Patriot succeeds Nike Hercules and Improved Hawk as the principal air defense missile against aircraft flying at medium and high altitudes. Patriot was approved for limited production in September 1980. At that time, it was still showing a low reliability and experiencing performance problems in certain combat environments. Contracts for the first 3 years' production were awarded as cost-plus incentive fee. This type of contract is normally used when a system's design is not yet stable, and the production risk is greatest. It is rare for a major weapon system production contract. Normally, when a system enters production, the design has been sufficiently stabilized and proven to permit awarding a fixed-price contract, under which the contractor would assume a share of the cost risk.

Over the past 2-1/2 years, estimates of Patriot's program costs have nearly doubled. The current program cost estimate stands at more than \$11 billion. Some of the same factors which caused cost increases in the past are still present, making future cost increases likely. The contractor is behind schedule because of production problems. Also, the Army believes available funds may not be sufficient to adhere to the planned annual procurement schedule. This may require protracting the schedule and buying in less economical quantities.

RELIABILITY HAS IMPROVED

Since the engineering development tests were completed in 1980, further testing has shown that the Army and the contractor have made good progress in resolving the Patriot's earlier reliability problems. The progress has been mainly in the hardware. The Army believes that reliability problems created by deficiencies in software have also been corrected. However, the modified software is still being tested. Other remaining problems are traceable to deficiencies in the maintenance software used to diagnose equipment failures.

MAINTAINABILITY DIFFICULTY

Testing has shown that the diagnostic software used with the system's built-in test equipment has successfully identified faulty components only 50 to 60 percent of the time. As a

result, the Army has decided to train additional personnel to maintain the system manually or with other test equipment that will not be built into the Patriot system. Further improvements to the maintenance software are needed, however, before the system can be adequately supported in the field.

PERFORMANCE IN CERTAIN COMBAT ENVIRONMENTS

While the system's overall performance in the presence of certain combat environments has improved, its performance could still be degraded, in some cases more seriously than others. The Army is developing improvements to increase the Patriot's ability in these environments. The improvements are to be tested in 1983.

RECOMMENDATIONS TO THE SECRETARY OF DEFENSE

GAO recommends that the Secretary of Defense permit the fiscal year 1983 funds to be applied towards an increase in the production rate over the current level of nine fire units, only upon a showing in the production tests that deficiencies have been corrected.

GAO also recommends that the Secretary direct the Army to negotiate fixed-price contracts for future Patriot production under which the contractor would assume a share of the cost risk.

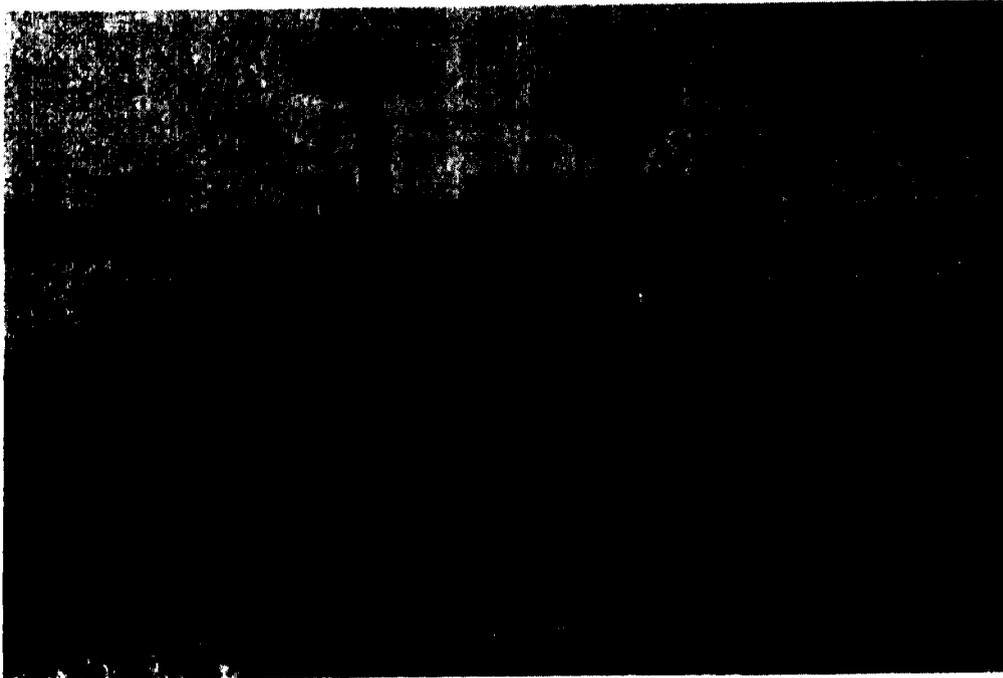
AGENCY COMMENTS

Defense officials said that they will provide the Secretary of Defense with the results of the production testing before the fiscal year 1984 production decision is due next fall. They do not agree that the results should influence the fiscal year 1983 buy because of the delay this would entail. In March 1983, the Army plans to definitize an existing letter contract for this procurement. The Army believes the risks of increasing production now are outweighed by the potential additional cost if production were held to nine fire units a year for another 2 years. Army officials estimate this additional cost at about \$250 million. These officials said they intend to award fixed-price contracts starting with fiscal year 1983 production.

GAO believes that delaying of the fiscal year 1983 contract for a few months would have minimal, if any, effect on the program's schedule and cost in view of the contractor's current inability to keep up with scheduled deliveries and the likelihood that it will be almost 1-1/2 years before the contractor draws even with the schedule. At the same time, a delay until production tests are concluded could provide the assurance, not yet at hand, that the Patriot will perform at or close to the level of Army requirements.

GAO made its review to determine the Army's progress in resolving Patriot's earlier performance and reliability problems in view of the bearing this could have on determining future production rates.

THE ARMY SHOULD CONFIRM SERGEANT YORK AIR
DEFENSE GUN'S RELIABILITY AND MAINTAINABILITY
BEFORE EXERCISING NEXT PRODUCTION OPTION



SOURCE: U.S. ARMY

ISSUES

*Logistics support • Adequacy of testing
Program management*

The Army's plans to test the reliability and maintainability of its new Sergeant York air defense gun had to be abandoned when the prototype the prime contractor delivered for testing in May 1982 was found to be unacceptable.

In a preliminary demonstration of the prototype, the radar fire control system failed to operate reliably, the graphic display unit failed intermittently, and the armament feed system's performance was unsatisfactory. During cold chamber testing, the system's controlling computer performed erratically in temperatures below 25 degrees Fahrenheit and the hydraulics, which would not operate properly without being preheated, developed numerous leaks. Army test and evaluation agencies subsequently concluded that the prototype was unsuitable for testing and recommended that the government tests be discontinued.

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JANUARY 27, 1983

Some reliability tests are being held at the Aberdeen Proving Ground, Maryland, but, instead of Army agencies performing them, they are being done under the joint direction of the Sergeant York project manager and the prime contractor, Ford Aerospace and Communications Corporation. This is a departure from the normal weapon system acquisition procedure which is to have new weapon systems tested and evaluated by Army agencies who operate independent of the project manager and are looked to for objective assessments. The scope of the contractor tests is smaller than what Army testers had planned.

Canceling the government's reliability, availability, maintainability, and durability (RAM-D) tests has caused some concern among officials in the Office of the Secretary of Defense who earlier supported Sergeant York's initial production last May.

The Army has no plans to have its test and evaluation agencies perform reliability and maintainability testing until after initial production units become available in March 1984. At that time, production tests will be run from which the Army plans to extract reliability and maintainability data. By that time, Sergeant York will have been in production almost 2 years. The contract with Ford has three production options. The first, for 50 systems, was exercised in May 1982. A decision on the second, for 96 systems, is due by May 1983. The third option, for 130 systems, must be exercised by May 1984. Altogether, the Army plans to procure 618 Sergeant Yorks at a program cost it now estimates to be \$4.2 billion.

PROTOTYPES NOT MEASURING UP TO REQUIREMENTS

The delivery of a prototype unsuitable for RAM-D testing continues a history of difficulties the contractor has had with developing a prototype free of a number of deficiencies. The prototype the contractor is now testing, and the one delivered for government testing, are modified versions of the first prototypes delivered for competitive testing in June 1980. Ford also modified the original prototypes before a 90-day "check test" begun in November 1981. Testing and evaluating the prototypes

each time they were delivered have disclosed numerous deficiencies and a need to upgrade and redesign them to achieve a satisfactory configuration for a production model. A production model will not be available until September 1983, its required delivery date.

Canceling the government's RAM-D tests is disconcerting since it indicates that at this late date the Ford Aerospace prototype still has some serious deficiencies. On the other hand, placing these tests largely under the direction and control of the contractor is consistent with the acquisition strategy which, throughout the development, has seen the government more in the role of an observer than a participant.

In GAO's view, this will permit a better assessment of the strategy to be made later on.

Nevertheless, an assessment of the prototype's progress is still crucial before a decision is made on whether to exercise the next production option. In the absence of the usual degree of participation by the Army test and evaluation agencies, the project manager seems to be the only one with sufficient knowledge of the program to assess Sergeant York's reliability and maintainability. With attention focused on the project manager's assessment, GAO believes the project manager will not permit any bias stemming from the role as a program advocate, to influence the report. The decision on whether to exercise the option, however, should be made at the highest Army level.

ASSESSMENT OF ACQUISITION STRATEGY IS PREMATURE

The strategy for procuring Sergeant York is unique. It leaves the contractor with full responsibility to design and produce a defense gun to meet general Army performance requirements. Throughout the development the Army has stood aside, adopting a so-called "hands-off" policy.

Since the acquisition strategy still has to run its course, an assessment of its success or failure is premature. It is apparent, however, that greater priority has been given to adhering to the schedule than to correcting some serious system performance problems at this

time. Moving ahead with the program, including exercising the first production option when the prototypes continue to exhibit serious shortcomings, attests to this. In the final analysis, the strategy's success will be measured by (in addition to successful containment of cost growth) Sergeant York's performance as well as its deployment on schedule. An assessment of the strategy should await the opportunity for the Army to test and evaluate a production model. Until such assessment can be made it would appear prudent not to repeat the strategy in a future weapon system acquisition.

CONCERNS PERSIST OVER SERGEANT
YORK'S MAINTENANCE AND SUPPORTABILITY

Two general concerns have been voiced about Sergeant York's maintenance. First, Army logistics evaluators are apprehensive about the limited built-in test capability that Sergeant York has demonstrated so far. Second, officials in the Office of the Secretary of Defense have questioned the planned maintenance concept by which sophisticated and unproven field maintenance test sets are to be located in the forward, direct support area. They believe that in the stressful conditions that prevail there the test equipment may not function properly, and they have asked that other maintenance concepts be formulated to support Sergeant York in its first 2 years of deployment until the test sets are proven out.

There is merit to the argument that it is risky to place unproven test equipment in the direct support area. However, advantages of doing so appear to warrant putting this equipment to the test in the forward area for an interim period so that its performance in stressful conditions can be gauged.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense

- require the Army to have the project manager prepare an assessment of Sergeant York's progress in the reliability and maintainability tests that the contractor is doing, and to have this report forwarded to the Under Secretary of the Army before the decision for exercising the second production option comes due;

--direct the Army, in whatever interim maintenance concept it elects to adopt, to provide for stationing some of the test equipment in the direct support area where it can be proven out before a final decision on its location is made; and

--refrain from again prescribing or endorsing the acquisition strategy followed in Sergeant York until the benefits of its application to that program can be evaluated.

AGENCY COMMENTS

Comments were received from the Department of Defense. Defense officials said that the decision to terminate the government tests stemmed from several factors. These included the belated realization that certain prototype subsystems were close to wearing out after 2-1/2 years of constant testing and the prototype's lack of a number of features that will appear in the production model, making that model more representative for test purposes.

GAO's concern is that there will be little authenticated information as to whether Sergeant York measures up to the Army's reliability and maintainability requirements until 2 years after production has begun.

Defense officials do not see a need to formally require a program assessment of Sergeant York's performance by the project manager before the decision on exercising the next production option. They said Army assessments are made continuously. GAO thinks it is important to have a formalized assessment to establish accountability, particularly since Sergeant York has had less government testing and evaluation than new weapon systems usually receive.

We undertook this review because of the impending important decisions to be made both by the Secretary of Defense and the Congress on a forthcoming Army request to continue to commit large resources to the procurement of Sergeant York.

STINGER POST AIR DEFENSE MISSILE:

--POTENTIAL PRODUCTION PROBLEMS

--PLANNED IMPROVEMENTS



SOURCE: U.S. ARMY

ISSUES

Operational/performance limitations • Production readiness

The Army has just completed development of the Stinger POST air defense missile, which provides better performance in coping with certain threats than an earlier version of Stinger now in production. Stinger POST is portable and shoulder-fired and uses the same airframe, motor, and warhead as the existing Stinger missile. Stinger POST's improved performance is due to its use of infrared and ultraviolet detectors to acquire and home-in on enemy aircraft--a new seeker referred to as the passive optical seeker technique (POST).

The entire Stinger program encompasses the development and production of about 50,000 missiles of which 40,000 will have the POST seeker. The reported estimated program acquisition cost is about \$4.3 billion.

Production uncertainties exist which could significantly affect program cost and delay

GAO/C-MASAD-83-10
JANUARY 26, 1983

procuring the quantity of missiles desired. The uncertainties relate to the difficulty of producing the ultraviolet detector and other critical seeker components in sufficient quantities to permit a high rate of production. The manufacturing processes tried so far have produced very low yields of high quality materials and components. Unless the yields can be increased, the quantity of missiles the Army hopes to obtain will cost more and take longer to produce. Consequently, the Army has awarded a contract to refine the processes going into the manufacture of high quality cadmium sulfide crystal, and ultraviolet detectors produced from the crystal. Also, the Army will try to effect more economical production of microelectronic chips and printed circuit boards in a production proofing phase (to validate the adequacy of production technology) to begin in March 1983. The success of these efforts is critical to full-scale production of the seeker.

Stinger POST's production will begin at a low rate with the award of the first production contract in April 1984. The Army plans to award a full-scale production contract in July 1985 even though production proofing will not be completed until July 1986. The Army's rationale for beginning full-scale production before this effort is completed is based on the expectation that production processes will have been sufficiently refined.

IMPROVEMENTS PLANNED TO OVERCOME LIMITATIONS

Although Stinger POST surpasses the existing Stinger in performance, the Army is planning several improvements to overcome certain limitations. The Army expects these improvements to add \$422 million to the program acquisition cost. Two of the improvements--the reprogrammable microprocessor and the night sight and ranging device--are particularly important. Although the Army's Training and Doctrine Command recommended that these improvements be initiated in fiscal year 1983, their development is not scheduled to begin before fiscal year 1985 due to funding difficulties. By the time they complete development, Stinger POST will be 2 or 3 years into high-rate production with about 45 percent of the missiles already under contract. GAO

believes the Army should reconsider accelerating the start of these two improvement programs.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense direct the Army to determine that satisfactory progress has been made toward resolving Stinger POST's production problems before committing the system to full-scale production.

Considering the benefit that could result from the proposed Stinger POST improvements, GAO also recommends that the Secretary of Defense direct the Army to assess the desirability of accelerating the improvement programs.

AGENCY COMMENTS

The Department of Defense provided GAO with official oral comments. Defense officials agreed with GAO's conclusions and recommendations. They are confident the Army can overcome the production problems before full-scale production begins, under the program they have planned for refining the cadmium sulfide production processes, as well as in the production proofing effort. Defense officials stated the Army would consider implementing the product improvement program at the Stinger POST production decision meeting scheduled for January 1983.

GAO's review of the Stinger POST program is part of its annual series of reviews of major weapon systems designed to help the Congress in its consideration of the Department of Defense budget.

CHAPTER 5

SUMMARIES OF SELECTED NAVY WEAPON SYSTEM REPORTS

NAVY NEEDS TO INCREASE S-3A READINESS TO ENSURE
EFFECTIVE USE OF PLANNED WEAPON SYSTEM IMPROVEMENTS



SOURCE: U.S. NAVY

ISSUES

Reliability, maintainability, and availability • Force level requirements

The S-3A is a carrier-based aircraft designed to protect U.S. surface ships from submarine threats. Offensive and defensive antisubmarine warfare has been a primary mission with surveillance of the ocean's surface a secondary mission. However, over the years the S-3A's role has changed significantly. Eliminating the specially dedicated antisubmarine warfare aircraft carriers and introducing the multi-purpose carrier, placed more emphasis on the S-3A's multimission capability.

S-3A WEAPON SYSTEM
IMPROVEMENT PROGRAM STATUS

To operate effectively in its multimission role and combat the increased threat, the Navy has embarked on a \$1.3 billion weapon system improvement program which will be a major modification to the S-3A. The program is to enhance the S-3A's mission effectiveness through updates and/or additions to acoustic,

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JANUARY 26, 1983

radar, electronic support measures, electronic countermeasures, and surface attack subsystems.

GAO reviewed this program to give the Congress a status report on the S-3A improvement program. GAO also looked at issues which may affect the effectiveness of the planned S-3A program.

It is too early to determine if the Navy will achieve the desired increase in S-3A mission effectiveness.

The S-3A program office is concerned about the timely delivery and additional funding needed for some of its operational software. Another concern is a recent \$15 million congressional cut in fiscal year 1983 research and development funds. The Navy states that if funds are not restored for this fiscal year the improvement program schedule will be lengthened and total development funding will increase.

Critical to the success of the S-3A improvement program will be the Navy's ability to improve the aircraft's operational readiness.

NAVY EFFORTS TO IMPROVE READINESS

The Navy, in its efforts to improve operational readiness, has taken several actions. These include establishing the Readiness Improvement Program and the Operational and Safety Improvement Program and instituting certain initiatives sponsored by the Chief of Naval Operations. Navy officials contend that these actions have required considerable leadtimes and all of the expected gains from these programs have not yet been realized. Navy officials predict that completing their readiness programs will provide a steady growth in operational readiness through the 1980s. They claim that readiness gains are already taking place primarily because of improved logistic support.

Unless the Navy can demonstrate by the limited production decision point that the S-3A's operational readiness goal is achievable, GAO believes the advisability of continuing the weapon systems improvement program should be reassessed.

Since introduction to the fleet in 1974, the availability of the S-3A aircraft to perform its missions has been limited. Poor operational readiness has been caused by low equipment reliability and maintainability as well as shortages of trained flight and maintenance personnel. Also, the S-3A has suffered from inadequate spares support.

The Navy claims that recent overall operational readiness has improved significantly. Because the Navy changed its readiness reporting methods, GAO cannot say to what extent operational readiness increased. However, failure rates for several mission critical systems are worse than they were in 1978.

NEED FOR MORE S-3 AIRCRAFT

The Navy has enough aircraft for current active squadrons, but sufficient numbers of aircraft are not available for attrition and reserve squadrons. Navy officials said this shortage will intensify on introducing two planned aircraft carriers into the fleet. As a result, the Navy must decide in the near future on how to resolve the shortage. The Navy has several options available.

RECOMMENDATION TO THE SECRETARY OF DEFENSE

GAO recommends that the Secretary of Defense require the Navy to provide assurance that the operational readiness goal will be attained or, if not attainable, that the mission capability can be fulfilled with a lesser performance. Future funding for the improvement program should depend on the above assessment.

AGENCY AND CONTRACTOR COMMENTS

Comments were received from the Department of Defense and were incorporated into the appropriate sections of this report. Defense agrees with the facts, conclusions, and recommendation presented in the report.

The Lockheed California Company, the S-3A prime contractor, supplied comments which also were incorporated into this report as appropriate. Lockheed stressed that carrier-based aircraft have not met or exceeded Navy's readiness goal

and that the S-3A has recently been among the top deployed performers based on published Navy data.

Lockheed said the report was factual and agreed with GAO's conclusion that the viability of the S-3B improvement program depends heavily on documented improvements in S-3A mission capability. Lockheed stated that Navy statistical data has shown significant S-3A readiness improvements.

STATUS OF THE CG-47 CRUISER AND
DDG-51 DESTROYER SHIPBUILDING PROGRAMS



SOURCE: U.S. NAVY

ISSUES

Operational/performance limitations • Operational requirements
Affordability • Adequacy of testing

The Navy's CG-47 cruiser is to provide quick reaction air defense against enemy aircraft and high performance antiship missiles. The DDG-51 destroyer is intended to be a surface combatant, similar to the CG-47 but costing sufficiently less to allow procurement in greater numbers. Both ships will have the latest systems for combating enemy air, surface, and undersea threats expected through the 1990s.

Because the CG-47 and the DDG-51 are high priority surface combatants needed to counter the enemy threat to the proposed 15 carrier battle group Navy, the Chairman of the Subcommittee on Defense, House Appropriations Committee, asked GAO to examine the status of the CG-47 and DDG-51 shipbuilding programs and to followup on issues raised in prior GAO reports. Briefly, GAO found that:

GAO/C-MASAD-83-11
FEBRUARY 22, 1983

- Operational testing of the CG-47's AEGIS combat system is scheduled for the May through September 1983 period. Consequently, the AEGIS combat system was not adequately tested before it was commissioned in January 1983.
- The Navy plans to install SPS-49 radar systems on the CG-47 class against the wishes of the House Appropriations Committee and contrary to a recommendation in a prior GAO report.
- The CG-47's displacement and center of gravity exceed design goals which could have an adverse effect on the ship's speed and stability.
- The estimated cost of the DDG-51 destroyer has increased to the point where the Chief of Naval Operations has said that it is not affordable and is not a lower cost alternative to the CG-47 as the Navy had intended.

RECOMMENDATIONS

The Secretary of Defense should closely monitor the Navy's February 1983 review of its proposal to fully test AEGIS. If the Secretary is convinced that the proposal will meet testing requirements, GAO recommends approval to start development.

GAO also recommends that the Secretary of Defense direct the Navy to:

- Discontinue the acquisition of SPS-49 radars for future CG-47 ships.
- Determine, before adding lower priority systems to the CG-47, that the incremental improvement to mission capability offsets the detrimental effects the increased weight will have on the ship's speed and stability.
- Reduce the cost of the DDG-51, as the Chief of Naval Operations has requested, to make the Navy's anti-air requirements affordable. Alternatively, if DDG-51 cost targets cannot be met or if significant reductions in combat capability are necessary to reduce costs, the Navy should consider buying an appropriate number of additional CG-47s. This issue

should be resolved at the March 1983 meeting of the Defense Systems Acquisition Review Council.

AGENCY COMMENTS

Comments were received from the Department of Defense and were incorporated throughout the report as appropriate. The comments concerning major topics of the report are summarized below.

- The CG-47's weapon system will not be fully tested against certain enemy threats before it is commissioned.

- The SPS-49 radar should remain on the CG-47 because it enhances the flexibility and capabilities of the ship's weapon system during periods of heavy enemy radar jamming. GAO believes, however, that the Navy has not demonstrated that the SPS-49 radar is essential to mission performance and believes it should not be purchased.

- The Navy does not consider the CG-47 to be overweight or unsafe, but officials will closely monitor equipment and other changes that could adversely affect the ship's performance and stability.

- If the current target cost of the DDG-51 (75 percent of CG-47 costs on a per ship basis) becomes unattainable or if reductions in capability are required to meet that goal, the Navy will consider buying additional CG-47s instead of DDG-51s.

THE NAVY'S RAPIDLY DEPLOYABLE

SURVEILLANCE SYSTEM NEEDS TO BE REASSESSED

ISSUES

*Operational/performance limitations • Affordability
Technical risk • Cost effectiveness • Program management*

The U.S. Navy has directed significant resources toward attaining an antisubmarine warfare (ASW) capability consisting of platforms, weapons, and sensors to counter the Soviet submarine threat. The forces' effectiveness depends on two broad types of sensors: (1) surveillance, which systematically observes large ocean areas to detect, classify, and locate submarine targets and (2) tactical, for detecting and targeting necessary to destroy a submarine.

The Rapidly Deployable Surveillance System (RDSS) is being developed as a surveillance sensor which also has tactical applications for observing a smaller ocean area. RDSS will consist of a field of moored, long-life acoustic buoys which normally will be aircraft deployed. The system will be used in areas where other undersea surveillance systems have no coverage, are not available, or their deployment is not practicable.

The concept of an expendable moored surveillance sensor was first proposed about 20 years ago. Various programs have been started but, because of development problems, size, weight constraints, and costs, they were stopped or restructured. RDSS evolved from these earlier efforts. It started in 1976 and has since been separated into two versions--a near-term version (Mod 0) and a far-term version (Mod 1).

The Navy expects the RDSS concept to greatly reduce the number of aircraft and/or flying hours needed to perform ASW missions. GAO believes Mod 0 is not likely to do this, but Mod 1 should if its design proves feasible.

The Mod 0 version transmits its data to P-3 or S-3 aircraft where it will be partially

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JANUARY 26, 1983

processed, analyzed, and displayed onboard the aircraft. The data also is recorded for further processing and analysis at ASW processing centers.

Mod 1 sends its data directly to an ASW processing center which fully develops the information without delay. This buoy will have all the Mod 0 features as well as additional features and capabilities. Thus, much of the Mod 0 development effort and technology is directly applicable to Mod 1. However, the program as currently structured will lead to production of the Mod 0 version which has tactical applications as its principal purpose.

As a deployed system, Mod 0's contribution to future strategic surveillance of enemy submarines or cost effectiveness in tactical applications remains questionable. It offers little assurance that its performance will result in increased effectiveness or that its costs can be justified. Other lower cost alternatives, such as a long-life sonobuoy now under development, merit closer Navy scrutiny before making a production decision on Mod 0--rescheduled for the mid-1980s.

Mod 1 shows promise to significantly reduce the number of aircraft and flying hours needed to take advantage of the savings Navy projected for the RDSS concept. However, GAO found that Mod 1 is in exploratory research with little funding and no apparent urgency. The Navy does not plan a formal review of Mod 1 until the mid-1980s.

In a 1981 study justifying the RDSS program, the Navy compared it to existing tactical sonobuoy capabilities. The study virtually ignored the advantages of Mod 1, concentrating on the benefits of Mod 0. Thus, certain costs associated with Mod 1 were not considered.

The study concluded that Mod 0 would initially cost more than existing sonobuoys but would be cost effective after 2 to 4 days of deployment in the ocean, depending on the mission.

GAO believes that, in addition to not considering the Mod 1 version, the study had limitations since it did not consider certain alternatives and other relevant issues identified below. Based on discussions with program officials, GAO also believes that Mod 0 would not become cost effective until about 10 to 15 days if the study had

- included, as an alternative to Mod 0, consideration of an improved long-life sonobuoy now under development;
- used realistic reliability and cost figures for Mod 0;
- considered signal processing improvements planned for the 1984 time frame which would allow more effective monitoring of larger numbers of sonobuoys; and
- used sonobuoys in their most efficient pattern design.

GAO believes the Navy needs to reassess the benefits of Mod 0 in relation to alternatives not previously considered, especially a long-life sonobuoy now under development and determine Mod 1 cost effectiveness.

GAO further believes a question exists as to whether the Navy should work toward starting production of Mod 0 for use in a surveillance role. It may be more desirable to work toward developing and producing the complete surveillance system.

**RECOMMENDATION TO THE
SECRETARY OF DEFENSE**

GAO recommends that the Secretary of Defense direct the Navy to reassess RDSS. Such an assessment should review the cost effectiveness of Mod 0, including

- consideration of the long-life sonobuoy,
- realistic reliability and cost figures,
- consideration of signal processing improvements, and

--the most efficient sonobuoy placement.

The assessment also should include the benefits and full costs associated with Mod 1. Future funding for producing either Mod 0 or Mod 1 would depend on this assessment.

AGENCY COMMENTS

The Department of Defense provided GAO with oral comments which have been incorporated in this report as appropriate. Defense disagrees with GAO's recommendation and believes that to reconsider or reverse the decision (to develop and deploy Mod 0) would delay or cause the RDSS program to be terminated. However, there is disagreement between Defense and Navy regarding whether RDSS is to be used primarily for surveillance or in tactical applications.

GAO believes this disagreement and the potential low-cost sonobuoy alternative reaffirm the need to reassess RDSS before future production funds are committed.

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GAO did this review to evaluate the Navy's efforts to develop RDSS and improve the Navy's ability to detect, classify, localize, and prepare to attack enemy submarines; however, GAO did not evaluate the Navy's ability to attack and destroy such submarines. GAO concentrated its efforts on the Navy's management of the RDSS program.

THE EFFECTIVENESS OF THE CONVENTIONALLY ARMED

LAND ATTACK TOMAHAWK HAS YET TO BE DEMONSTRATED



ISSUES

Operational/performance limitations

The effectiveness of the Navy's conventionally armed land attack TOMAHAWK cruise missile is severely curtailed. According to the Commander-in-Chief, Pacific, this version of the TOMAHAWK needs substantial modifications to be effective against most targets assigned to the Pacific Command.

TOMAHAWKS armed with conventional warheads must have extremely accurate terminal guidance to have reasonable expectation of destroying their intended targets. The missile must be capable of delivering the warhead either directly onto the target or within a few feet of the exact aiming point.

The need for TOMAHAWK improvements is not a new issue to the Navy. It has also been discussed in prior GAO reports. For example, in one report, we recommended that the Secretary of Defense withhold authorization for full-scale production until accuracy and survivability are convincingly demonstrated. 1/ The

1/Some Land Attack Cruise Missiles Acquisition Programs Need to Be Slowed Down (C-MASAD-81-9, Feb. 28, 1981).

Department of Defense, in response to our report, said it was premature to judge the program when significant, scheduled operational testing remained to be completed before a production decision was made.

That serious problems remain to be resolved is also evidenced by Navy plans to restructure the TOMAHAWK program. The restructured program includes a plan for several improvements and is scheduled to start the third quarter of fiscal year 1983. According to the Navy, the restructured program will expand the conventional TOMAHAWK target base, while reducing mission planning efforts. The Navy estimates this effort will require eight test flights and cost about \$13.3 million through 1985. The Navy rates development risks as low. At this point, we have not assessed the risk factors.

Production of the conventionally armed TOMAHAWK has been limited to 44 missiles--a level which supports the restructured program and will provide the fleet with a horizontal attack capability. These missiles were funded using fiscal year 1980, 1981, and 1982 appropriations. In addition to these missiles, the Navy plans to resume conventional TOMAHAWK production in fiscal year 1985.

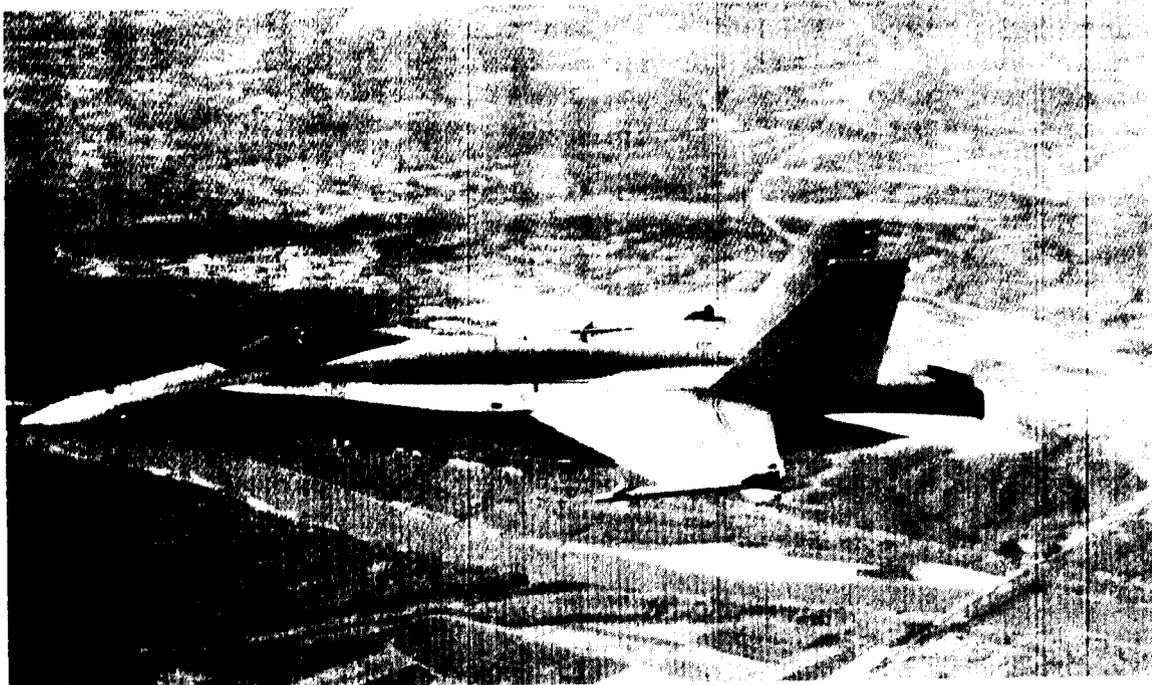
CONCLUSION AND RECOMMENDATION

Given the concerns noted above about the operational use of the conventionally armed land attack TOMAHAWK, we recommend that the Secretary of Defense direct the Navy to limit its acquisition of these missiles to the 44 already funded until the modified missile's effectiveness can be demonstrated.

AGENCY COMMENTS

We discussed our concerns expressed in a draft of this report with officials from the Office of the Secretary of Defense and the Department of the Navy. They agree that a problem still exists with the terminal maneuver capability of the missile, but believe the restructured program will lead to a satisfactory resolution of the problem.

NAVY'S F/A-18 PROGRAM FACES BUDGET CONCERNS AND
PERFORMANCE LIMITATIONS AS AIRCRAFT ENTER THE FLEET



ISSUES

*Operational/performance limitations • Logistics support
Incomplete data reporting*

The F/A-18 naval strike fighter is a twin-engine, single pilot, aircraft carrier-capable aircraft designed to replace the F-4 and the A-7, and perform both fighter and attack missions for the Navy and the Marine Corps. The F/A-18 entered production in 1979. In 1981 the Secretary of Defense approved full production of the aircraft to fulfill the fighter mission requirements. On March 17, 1983, the Secretary approved full production for the Navy's attack mission requirements as well. The F/A-18 entered fleet service in 1983 as the first three fighter squadrons based at the El Toro Marine Corps Air Station, Santa Ana, California, began receiving their aircraft.

GAO's review, made at the request of the Chairman, Subcommittee on Defense, House Committee on Appropriations, showed:

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JUNE 10, 1983

--The Navy employed a series of budgetary and funding practices to cover increases in the cost of building the F/A-18 which cause concern.

--The Navy believes the F/A-18's performance deficiencies have or will be resolved, but GAO believes range may still be a problem.

--The unavailability of essential equipment and delays in the Navy's logistics support program may limit the F/A-18's operational effectiveness as the aircraft enters fleet service.

F/A-18 PROGRAM FUNDING
PRACTICES CAUSE CONCERN

Procuring a new modern weapon system entails substantial financial and technological risks. The Department of Defense must have a degree of flexibility in procuring these systems to minimize these risks and ensure sound acquisition management. However, this flexibility must be consistent with the Congress' oversight responsibilities and intent in appropriating public funds. The funding practices employed by the Navy to cover increases in the cost of building the F/A-18 have caused congressional concern regarding oversight and the use of appropriated funds as the Congress intended.

Between 1979 and 1982, the Congress appropriated \$5.2 billion to build 157 F/A-18s and to buy the unique logistics support equipment needed to field the aircraft. During that time, the cost of building the aircraft exceeded the funds budgeted for this purpose by about \$310 million. This was because of the negotiated F/A-18 contract prices from 1979 to 1982 having consistently exceeded what the Navy budgeted, and the prime contractor having projected overruns on the 1979, 1980, and 1981 contracts. To pay for most of this shortfall, the Navy used funds budgeted for F/A-18 logistics support, which supplied \$161 million, and funds appropriated for other Navy aircraft programs which have or are projected to supply about \$139 million more. As a result, executing the F/A-18 budget over the last 4 years has differed significantly from the program presented and justified to the Congress. This has led the House Appropriations Committee to require additional information from the Secretary of Defense before considering the F/A-18's fiscal year 1984 budget request.

The Navy has

- twice requested and received funds for the same support items,
- used the support portion of the budget to include unidentified management reserves,
- shifted the cost of some essential support items out of the F/A-18 program, and
- avoided obtaining the approval of congressional committees by reprogramming funds after they expired. (Unobligated funds from expired accounts are available for use by the Navy for 2 additional years.)

On November 12, 1982, GAO provided much of the foregoing information to the staff of the Subcommittee on Defense, House Appropriations Committee. Similar information had been developed by the Committee's Surveys and Investigations staff. Reacting to these disclosures, the Committee Chairman requested the Secretary of Defense to order a detailed financial audit of F/A-18 contract transactions and funding practices, and furnish this and certain legal opinions to the Committee. This review was made by the Defense Department's Inspector General and General Counsel.

GAO discussed its findings with the Inspector General's staff in January 1983. Their report cited similar budget and funding issues discussed in this report. In addition, the Inspector General's report discussed deferral of essential items on production aircraft, and weaknesses in the Navy's accounting and financial reporting systems. The Navy, while agreeing that the funding practices and contract restructuring did occur, took exception to many conclusions and recommendations in the Inspector General's report. For example, the Navy stated that essential items were not deferred to offset cost growth, but rather were deferred because of technical delays and other factors beyond their control.

DEPARTMENT OF DEFENSE APPROVES FULL
F/A-18 PRODUCTION: RANGE STILL AN ISSUE

In March 1983, the Secretary of Defense approved full production of the F/A-18 to fulfill the Navy's light attack mission. This action followed an independent evaluation by the Navy's

Operational Test and Evaluation Force made from May to October 1982. The independent testers noted several deficiencies, the range of the aircraft being the most serious. Based on several factors, the testers recommended that service-use-approval of the F/A-18 for the Navy's light attack mission not be granted.

The Navy believes that the problems identified in the operational test and evaluation have been or will be corrected. GAO believes, however, that range may still be a problem. The Deputy Secretary of Defense and the Navy stated that enhancing the F/A-18's operational range is required for long-range wartime attack interdiction missions and peacetime carrier training operations. The Navy's independent testers believe that unless a resolution is found for the F/A-18's demonstrated range limitations, the capabilities the Navy will gain in replacing the A-7 with the F/A-18 will not offset the capabilities the Navy will lose.

The Navy considered two options to enhance the F/A-18's operational range. One was to increase carrier-based aerial refueling support and the other was to equip the F/A-18 with larger external fuel tanks. Both of these options entail some problems. On April 6, 1983, the Department of Defense told GAO it had decided to provide aerial refueling to resolve F/A-18 range limitations. GAO has reservations about this approach to resolve the range limitation problem.

F/A-18 ENTERS FLEET SERVICE WITH LIMITATIONS

The F/A-18 entered fleet service in 1983 as the first three Marine Corps squadrons began receiving their aircraft. These squadrons are scheduled to receive all their aircraft by August. The squadrons will train during 1983, and two of them will begin reporting combat readiness in January 1984.

Using F/A-18 support funds to pay for increases in the cost of building the F/A-18 does not appear to have adversely affected the Navy's ability to adequately support the aircraft in any significant way to date. However, two areas may limit the F/A-18's operational effectiveness and supportability as the aircraft enters fleet service. First, effective F/A-18 deployment depends on successfully developing a new generation of

electronic warfare systems. These systems are experiencing some problems. Second, technical and schedule problems continue to delay the development and delivery of equipment needed for the Navy to take over F/A-18 logistics support from its contractors. Other problems could result if deficiencies identified in operational testing are not successfully corrected.

AGENCY COMMENTS AND GAO'S EVALUATION

The Department of Defense gave GAO official oral comments on a draft of this report. The Department generally concurred with the findings and conclusions in this report but declined to comment on several issues related to the use of F/A-18 support funds because the Department's position on this matter had not been definitively resolved. Other comments specifically relating to funding practices, performance deficiencies, and fleet introduction are summarized with GAO's evaluation at the end of Chapters 2, 3, and 4, respectively. Written comments dated May 13, 1983, were provided on GAO's draft report by the Acting Under Secretary of Defense for Research and Engineering. These written comments are not substantially different from the oral comments provided earlier and are included in their entirety as Appendix II to this report.

CHAPTER 6
SUMMARIES OF SELECTED AIR FORCE
WEAPON SYSTEM REPORTS

ACQUISITION OF THE OVER-THE-HORIZON

BACKSCATTER RADAR SYSTEM SHOULD BE REEVALUATED

ISSUES

*Operational requirements • Cost effectiveness
Program concurrency*

The Over-the-Horizon Backscatter (OTH-B) radar system is to provide a long-range tactical warning capability to help counter a threat of a Soviet precursor bomber attack on the continental United States. Acquisition costs are estimated to be almost \$1 billion for east and west coast OTH-B facilities, each including three radar sectors, and about \$1.3 billion if a third facility is added. These figures include a provision for inflation to the end of the acquisition.

PROGRAM DEVELOPMENT

The OTH-B program was started in 1970. In 1975 a contract for a prototype system was awarded, but this system experienced cost, schedule, and technical problems. In 1977 the program was restructured and an experimental radar system was built to demonstrate technical feasibility rather than function as an operational prototype system. Initial testing of the experimental system, however, showed that the radar would not meet performance requirements for an operational system. These requirements were later revised and the Air Force has continued into full-scale development.

The Air Force plans to begin production of the OTH-B radar system before development is completed. Initial development testing is not planned to begin until production is far advanced. Cost, schedule, and technical risks associated with the current program are assessed by the Air Force as low to moderate. Schedule slippages, as well as cost increases, may occur because operational testing of the system will not begin until all of the east coast facility and much of the west coast

GAO/C-MASAD-83-14
MARCH 15, 1983

facility is completed. The severity of problems identified in testing, and how quickly they can be resolved, will dictate the magnitude of any cost or schedule increases. It is too early to predict, however, whether serious problems will in fact occur.

ACQUISITION MAY NOT
BE JUSTIFIED

Near-term solutions, as well as long-term alternatives, are being pursued to strengthen U.S. tactical warning capabilities. Both the Air Force and the Navy plan to develop tactical warning systems for use during the 1990s that will withstand a greater threat environment than the OTH-B. In the near term, the Air Force plans to randomly patrol with some existing airborne warning and control system aircraft to strengthen tactical warning capabilities until the OTH-B radar system is operational.

The threat of a precursor Soviet bomber attack against the United States is the scenario used to justify the need for the OTH-B radar system. Considering the threat described in intelligence reports, along with the alternatives to OTH-B, GAO questions the need to acquire the OTH-B radar system as now planned.

RECOMMENDATION TO THE
SECRETARY OF DEFENSE

GAO recommends that the Secretary of Defense direct the Air Force to fully reassess the need and justify the decision to acquire the OTH-B radar system. Specifically, factors to be considered are the threat, the status of efforts to develop more endurable tactical warning systems, and the potential and cost effectiveness of using existing airborne warning assets to strengthen surveillance coverage against a surprise bomber attack until a more endurable system than OTH-B can be deployed.

AGENCY COMMENTS AND
GAO VIEWS

The Department of Defense orally commented that the OTH-B hardware was successfully tested during the initial test and evaluation of the experimental radar system and that only refinements to design are needed. In GAO's opinion, this is somewhat misleading since the experimental system was not intended to be an operationally representative prototype system. Instead, it was to demonstrate the feasibility of OTH-B technology, and as such, had no stated operational requirements. Also, a substantial redesign effort for both hardware and software is involved in moving from the experimental radar to an operational OTH-B radar system.

The Department of Defense officials said GAO took comments from an intelligence analysis out of context. For example, Defense officials said the draft report failed to consider the future threat of a new Soviet long-range bomber and an air-launched cruise missile.

GAO does not feel that its draft report used comments from the intelligence analysis out of context. However, GAO revised the report to reflect virtually all of the applicable sections of the intelligence analysis to alleviate any such concerns. GAO also included more information on the future threat of a new Soviet long-range bomber and air-launched cruise missile.

GAO did this review to provide the Congress with an independent evaluation of the status of the OTH-B program, including its cost, schedule, and performance status, and an evaluation of the factors justifying deployment.

U.S. ANTISATELLITE PROGRAM

NEEDS A FRESH LOOK



SOURCE: U.S. AIR FORCE

ISSUES

*Operational requirements • Affordability
Cost effectiveness*

Current and projected Soviet space capabilities are a known threat to U.S. and allied land, sea, air, and space forces. According to the Department of Defense (DOD), the Soviets have a vigorous and constantly expanding military space program. Soviet space systems support reconnaissance, electronic intelligence, missile launch detection, communications, meteorology, and navigation. The Soviets have the only antisatellite system known to be operational.

The demonstrated Soviet antisatellite system poses a known threat to U.S. satellites. It is anticipated the Soviets will continue work in this area.

The United States is pursuing an antisatellite development program, using miniature vehicles launched from an F-15 aircraft and propelled by a two-stage missile. The cost to complete the system has been estimated at about \$3.6 billion.

When the Air Force selected the miniature vehicle technology as the primary solution to the antisatellite mission, it was envisioned as a relatively cheap, quick way to get an anti-satellite system that would meet the mission requirements. This is no longer the case. It will be a more complex and expensive task than originally envisioned, potentially costing in the tens of billions of dollars.

Now is the time to determine whether the United States is developing the appropriate capability to perform the antisatellite mission.

TECHNOLOGICALLY FEASIBLE
ALTERNATIVES TO THE MINIATURE
VEHICLE EXIST

GAO compared several alternatives to the miniature vehicle. These included

- missiles,
- ground-based lasers,
- airborne lasers, and
- space-based lasers.

Since these weapons are based on different technology than the miniature vehicle, their cost, schedule, and performance characteristics differ. Although some recent studies have been made of alternatives, they are not fully comparable because they are based on different assumptions. A new antisatellite assessment needs to be made for all antisatellite alternatives.

Based on comments from DOD officials on GAO's draft report, it appears that DOD is fully committed to producing the current air-launched miniature vehicle system, unless development is unsuccessful. GAO was told that this course of action best recognizes the current political, military, and financial realities. GAO believes that this is an issue the Congress may wish to consider and determine whether it agrees with DOD's plans for obtaining the capability to perform the antisatellite mission.

RECOMMENDATION TO THE CONGRESS

GAO recommends that the Congress review DOD's plans for performing the antisatellite mission. The Congress may wish to direct DOD to provide it with a current assessment of alternatives to the miniature vehicle type antisatellite system to enable it to make a timely evaluation of DOD's plans before the air-launched miniature vehicle enters production.

AGENCY COMMENTS

GAO received official oral comments from DOD on a draft of this report. DOD disagreed with GAO's interpretation of the facts presented and the overall negative tone of the report toward the air-launched miniature vehicle program. DOD believes that evaluating the current air-launched miniature vehicle's performance against the current 1981 Joint Chiefs of Staff's antisatellite requirements instead of the requirements stated in the current Mission Element Needs Statement was inappropriate. GAO believes that it is appropriate and therefore disagrees with DOD's position.

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GAO's review of the current Air Force anti-satellite program and alternative weapon systems capable of providing an antisatellite capability was undertaken as a result of the interest in the area by the Congress and DOD. GAO's review assessed DOD analyses of anti-satellite alternatives, including the estimated costs of these alternatives.

WIDE AREA ANTIARMOR MUNITIONS:

TERMINATE ONE SYSTEM AND REVIEW TWO OTHERS

ISSUES

*Operational/performance limitations
Affordability • Technical risk*

To assist in countering the Warsaw Pact's numerical armor advantage, the tactical air forces must be capable of delaying or preventing the enemy from moving to the central battlefield. To do this, they need weapons that can destroy several armored vehicles each time the attacking aircraft passes over a target area. The Air Force expects the Wide Area Antiarmor Munitions (WAAM) program to provide weapons that have a high-multiple-kill-per-pass capability. However, one of the systems being considered should be terminated because it will not meet minimum requirements, and the other two systems rely on new unproven technology and involve weapons delivery concepts that have not been demonstrated.

WAAM is a family of area munitions being developed to provide the tactical air forces a multiple-kill capability against tanks, armored personnel carriers, self-propelled artillery, and support vehicles. Specifically, a plane loaded with the munitions should kill several target vehicles per pass in day, night, and adverse weather operations. Also, to increase aircraft survivability, the weapons must be capable of being delivered from stand-off positions or at low altitudes without the pilot visually seeing the target.

The present WAAM program consists of the (1) Antiarmor Cluster Munition, which is in full-scale development, (2) Extended Range Antiarmor Munition, which recently completed the validation phase, and (3) Wasp, which is in its third year of the validation phase. That phase is expected to be completed in May 1983. The overall program cost estimate total \$10.5 billion--\$895 million for research and development, \$9,191 million for procurement, and \$407 million for support.

FINDINGS AND CONCLUSIONS

The Antiarmor Cluster Munition is an unguided cluster bomb of 48 submunitions packaged in the Air Force's Tactical Munitions Dispenser. This system, delivered by attack aircraft like the F-16, was to provide an interim near-term capability. It was envisioned as a low-cost, low-risk munition. However, according to Air Force and contractor studies, it will not provide the Air Force the capability it needs, it will not perform as required, and it is little or no better than munitions in the existing inventory and other near-term antiarmor systems.

In addition, it is 18 months behind schedule, and it will cost about \$865 million more than initially expected.

The Extended Range Antiarmor Munition and Wasp are the "smart," high-risk, long-term WAAM. They are being designed to detect and guide munitions to potential targets without exposing the delivery aircraft. While the Air Force expects these munitions to provide the capability it needs to counter the Warsaw Pact's armored threat, they

--rely on high-risk technology and involve new unproven operational concepts and

--need to be supported with advanced target location and command, control, and communications equipment to achieve optimum stand-off capability.

Although much validation and follow-on testing remains to be done, several technical and operational problems have already surfaced. In addition, both systems are behind schedule, and they will cost about \$6.3 billion more than initially expected.

The WAAM program may eventually provide the tactical air forces a class of weapons to counter the Warsaw Pact's second echelon armor before it gets to the central battlefield. However, the Antiarmor Cluster Munition program should be terminated. As designed, it will not provide the multiple kills per pass the tactical air forces need, and it is little or no

better than inventory and other near-term anti-armor weapons.

It is too early to forecast success for the Extended Range Antiarmor Munition and Wasp. While they look promising, both systems involve new technology and operational techniques that have not been demonstrated. Before committing major funds to these programs, the Air Force should validate the critical technology and demonstrate that the operational techniques are feasible.

RECOMMENDATIONS TO THE
SECRETARY OF DEFENSE

GAO recommends that the Secretary of Defense require the Air Force to validate critical technology and demonstrate operationally effective delivery concepts of the Extended Range Antiarmor Munition and Wasp before making major commitments of funds.

RECOMMENDATION
TO THE CONGRESS

In a letter of August 25, 1982, ^{1/} GAO informed the Secretary of Defense of the Antiarmor Cluster Munition's shortcomings and recommended that he direct the Secretary of the Air Force to terminate development of the Antiarmor Cluster Munition system and to report the amount of unobligated funds previously committed to its acquisition, which, as a consequence, might be used for other purposes.

By letter of November 4, 1982, the Under Secretary of Defense, Research and Engineering, informed GAO that the results of certain tests were still being analyzed. The letter indicated that a decision would be made on the termination issue by mid-December 1982 and that GAO would be notified of the decision. As of mid-January 1983, GAO was not notified.

GAO recommends that the Congress not appropriate any additional funds for the Antiarmor Cluster Munition system and require that the

1/C-MASAD-82-22.

Secretary of Defense explicitly account for any unobligated funds previously appropriated for acquisition of this system.

AGENCY COMMENTS

The Department of Defense provided GAO with official oral comments, and the comments have been incorporated into this report as appropriate. These comments reflected general concurrence with GAO findings and recommendations. A few minor changes suggested by the comments have been incorporated to improve clarity.

THE B-1 BOMBER PROGRAM--A NEW START



ISSUES

*Incomplete data reporting • Program management
Adequacy of testing • Reliability, maintainability, and availability*

We recently completed our review of the B-1B bomber program. This review was made because the B-1B is a key element of the strategic force modernization program, is costly, and has a compressed development and production schedule to meet the initial operational capability date of 1986. Our review was also directed at examining the B-1B cost estimates, management plans, and cost performance reports.

The Air Force and the Department of Defense activities involved in the B-1B acquisition were visited to discuss the program with Air Force and other Defense personnel. The contents of a draft of this report were discussed with the Office of the Secretary of Defense (OSD) and Air Force officials and their comments have been incorporated as appropriate. Our review was made in accordance with generally accepted government auditing standards.

We found that the B-1B program cost estimate still omits known program costs. These omissions were reported by us to the Subcommittee on Defense, House Committee on Appropriations, by testimony on July 22, 1982. We are concerned that the cost

GAO/MASAD-83-21
APRIL 13, 1983

omissions obscure congressional visibility of the B-1B acquisition. In this regard, we recommend that you have your Office provide the Congress in a single package an estimate, including all the acquisition costs related to the B-1B program.

We would also like to share with you observations on some other areas for your future consideration as the program matures. These areas include multiyear procurement, logistics, and testing.

A brief discussion on cost estimate omissions and the other areas follow.

**B-1B COST ESTIMATE STILL
EXCLUDES CERTAIN COSTS**

The B-1B \$20.5 billion cost estimate prepared by the B-1B Program Office to acquire 100 aircraft excluded program acquisition costs of about \$1.4 billion identified by independent OSD and Air Force cost analysts. Our testimony in July 1982 before the House Appropriations Committee, Subcommittee on Defense, discussing the B-1B program cost estimate reported these cost omissions.

In our view, OSD and Air Force guidance defining program acquisition costs permit varying interpretations of what is to be included in major acquisition cost estimates. For example, one instruction requires all costs to be included in the program estimate unless funded by a separate program element. The important factor in this instruction is how the item is funded. Another requires that the cost estimate include all directed effort for which the program office has management responsibility, regardless of the source of funds. A third instruction dealing with Selected Acquisition Reports is so vague in describing program acquisition costs that one could use many interpretations.

We believe the different interpretations of the acquisition cost guidance was highlighted by OSD and Air Force independent cost estimates prepared on the B-1B program. The independent analysts concluded that many costs excluded from the program cost estimate historically have been included in weapon system acquisition cost estimates and should be included in the B-1B estimate. The following chart shows the costs identified.

<u>Cost category</u>	<u>Air Force independent cost group</u>	<u>OSD independent cost group</u>
	(in billions of fiscal year 1981 dollars)	
Simulators	\$.340	\$.300
Continuing engineering develop- ment/component improvement	.187	.150
Development of organic depot capability	.237	.400
Miscellaneous (i.e., first destination transportation; others)	.020	.100
Interim contractor support	.034	.263
Facilities	.068	.070
Retrofit costs	.567	-
Manufacturing technology	<u>-</u>	<u>.150</u>
Total	<u>\$1.453</u>	<u>\$1.433</u>

We feel that excluding certain program costs from the estimate is an important issue concerning the B-1B program. We believe that the Congress would have better visibility of the acquisition cost if all related costs were reported in one place. Excluding cost items from the B-1B program element could also cloud the funding process and unintentionally affect the time phasing of funds later on in the aircraft program. In this regard, the Air Force Systems Command noted that the design of the Defense planning, programming, and budgeting system intended that all components of a weapon system be accumulated under a single program element for management visibility.

AIR FORCE PLANS MULTIYEAR
PROCUREMENT IN THE B-1B PROGRAM

The Air Force is planning to keep program acquisition costs down through multiyear procurement initiatives. However, the Air Force has not yet demonstrated that the B-1B program meets the procurement criteria for that type of contracting. The criteria, set out in Public Law 97-86 and an OSD policy memorandum, require that the (1) multiyear procurement benefit the government through reduced contract costs and enhanced national security, (2) agency have confidence in the estimated cost savings, (3) equipment be stable in design, (4) program have stable funding, and (5) requirement continues to be valid.

The B-1B acquisition estimate of \$20.5 billion includes an \$800 million (fiscal year 1981 dollars) savings for multiyear procurement. An Air Force analysis in November 1982 based on preliminary inputs from contractors indicated savings of less than \$800 million if the program is initiated on the existing schedule beginning in fiscal year 1984. Air Force officials informed us that firm contractor proposals were received by the Air Force in December 1982 and evaluations of them are in progress.

To come closer to achieving the \$800 million savings, the Air Force may seek congressional approval for multiyear procurement authority through a supplemental request for fiscal year 1983. If approval is granted, the Air Force would authorize contractors to purchase economic order quantities of items and materials considered stable, and available at a cost savings. According to Air Force officials, the early multiyear procurement authority proposal would not require additional funds in fiscal year 1983, but would be a reprogramming action.

Previously, on September 13, 1982, we reported to the Chairman, Subcommittee on Defense, House Committee on Appropriations, that the projected multiyear cost savings of \$800 million for the B-1B program were based on a methodology we considered very unreliable and that discounting had not been used to consider the time value of money.

The multiyear criteria require a program to have a stable design before this method of procurement is acceptable. An OSD policy memorandum on multiyear procurement dated May 1, 1981, stated,

"The item should be technically mature, have completed research, development, testing and evaluation (RDT&E)--including development testing or equivalent--with relatively few changes in item design anticipated and underlying technology should be stable."

The research, development, test and evaluation phase for the B-1B, full-scale development effort is scheduled to continue into fiscal year 1987. For fiscal year 1984 through 1987, 51 percent of the research, development, test and evaluation funds are to be requested for the B-1B program. Further, the development flight testing for the program is to continue through June 1986. Avionics flight testing will not start until July 1984.

Air Force officials informed us that the B-1B will offer a stable configuration and be technically mature at the time multiyear procurement contracts are awarded. They believe stability is achievable early in the program because of the prior B-1A airframe and engine development and testing program and because B-1B offensive avionics are partly common with the B-52 and the F-16.

After our discussion with Defense officials on a draft of this report in early January 1983, the Chairman, Subcommittee on Defense, House Committee on Appropriations, by letter dated January 28, 1983, requested us to assess Defense's proposed multiyear candidates, including the B-1B, in the Defense fiscal year 1983 supplemental budget. We are in the process of obtaining from the Air Force the detailed support as to how the Air Force believes the B-1B program meets the legislative criteria for multiyear contracting.

LOGISTICS SUPPORT CONCERNS

B-1B maintenance concept centers around built-in test equipment

The B-1B maintenance concept depends on the built-in test equipment, Central Integrated Test System (CITS), to determine what subsystems are faulty while the aircraft is in operation. It is to be connected with a ground data processing system which accumulates data to analyze aircraft maintenance trends to help reduce maintenance and predict failure of components critical to flight safety and the aircraft mission.

According to an Air Force Test and Evaluation Center report dealing with other aircraft that have a built-in test system, isolating equipment problems has historically been difficult to accomplish with any reasonable level of success. The B-1A CITS for the most part was unsuccessful and failed to adequately perform to specifications. In this regard, failure of CITS to perform as desired in the B-1B could result in increased costs for spares; additional test equipment; and a need for additional, more highly trained maintenance personnel. Or it could result in acceptance of reduced aircraft readiness.

The Strategic Air Command considers the development of CITS in the B-1B program as an item of concern. They have indicated a desire to reinforce the CITS capability with additional on-aircraft or flight-line test equipment to provide backup should CITS not work as planned.

B-1A program did not emphasize logistics support

Logistics support considerations normally begin with the initiation of a weapon system concept. The purpose is to fully integrate logistics planning with engineering planning for the system and produce timely, cost-effective support. By the time full-scale development of the system is initiated, logistics planning should be mature. The B-1A program was oriented toward aircraft research and development efforts before it was terminated in 1977. Logistics support planning and development was being deferred until a production commitment was established. Although such a commitment was made in December 1976, the program was terminated in June 1977. Research and development and

flight testing efforts continued on the B-1A aircraft after the acquisition program was terminated in 1977, but logistics support activities were minimal.

The B-1B logistics planning has been adversely influenced by an Air Force decision in the earlier B-1A program to defer development of logistics support. Because logistics support data and plans were limited in the earlier program, the B-1B logistics planning and development is behind other program efforts. The program manager is well aware of these problems and logistics planning and development is being given considerable attention.

B-1B program cost constraints could affect developing logistics support

The B-1B acquisition cost estimate of \$20.5 billion did not include costs to develop peculiar organic depot support. Moreover, to stay within cost constraints, the Deputy Secretary of Defense directed the Air Force to develop such support without an increase in the acquisition cost estimate. Thus, the organic depot support development (estimated to be about \$400 million by the B-1B cost estimating team that prepared the acquisition estimate) must be absorbed in the \$1.8 billion estimated for all support activities peculiar to the B-1B.

The Deputy Secretary of Defense also directed the B-1B Program Office to control the B-1B design so as not to exceed the programmed 6 percent engineering change order budget. Typical aircraft programs use from 9 to 11 percent of flyaway costs for engineering change order budgets. Because of this constraint, the B-1B Program Office logistics officials do not foresee any logistics enhancement unless they also reflect significant acquisition cost savings.

Air Force officials, however, believe that past B-1A development efforts should reduce the need for engineering changes in the new program. They consider the maturity of the airframe and engine as sufficient in lowering engineering change requirements.

TEST PROGRAM--PAST AND FUTURE

A significant amount of testing was done under the prior B-1A program. There have been, however, configuration changes and redesigned avionics for the B-1B aircraft. Therefore, it is uncertain at this time how much of the earlier testing results can be applied to the new program. The Air Force currently is evaluating the prior test data to determine what is or is not applicable to the new program.

Time available for flight testing before the initial operational capability date in 1986 is limited. This is especially

true for evaluating the effectiveness of the new defensive avionics. Avionics testing is scheduled to begin in July 1984 in a B-1A prototype aircraft. The first production B-1B aircraft flight testing is scheduled to begin in March 1985.

Between December 1974 and April 1981, four B-1A test aircraft flew about 1,900 hours completing about 90 percent of the scheduled airframe testing and about 67 percent of the flying quality test items. Flight tests conducted between February 1979 and April 1981 in the B-1A program showed that defensive avionics countermeasures system never had time to mature to a level needed for operational testing.

Test schedule

Aircraft flight testing for the B-1B program is directed toward delivering a weapon system to the Strategic Air Command with a proven degree of performance by the initial operational capability date. The flight test program is limited by contract to activities which the contractor can accomplish by June 30, 1986. The flight test schedule follows:

<u>Aircraft</u>	<u>Test duration</u>	<u>Months per aircraft</u>	<u>Total planned hours</u>	<u>Primary test purpose</u>
B-1A #2	Apr. 15, 1983, to Nov. 15, 1984	19	275	Airframe testing
B-1A #4	July 15, 1984, to June 15, 1986	23	420	Avionics testing
B-1B #1	Mar. 15, 1985, to June 15, 1986	15	<u>305</u>	First production aircraft testing
			<u>1,000</u>	

The Air Force is responsible for additional test hours to demonstrate open design requirements the contractor is unable to accomplish within the 57-month flight test program imposed by the contract. If the Air Force does not buy additional flight test time to demonstrate the aircraft's design acceptability, the contractor will not have to meet the contract design requirements. The contractor informed the Air Force that limitations beyond its control, such as range support, weather, associate contractor support, and so forth, could inhibit the achievement of some flight test goals. Operational test objectives not satisfied during the combined development and operational flight program are to be addressed in follow-on testing budgeted outside the B-1B baseline.

AGENCY COMMENTS AND OUR EVALUATIONS

We received oral comments on a draft of this report from Defense officials. They informed us that the Air Force guidance for major weapon systems acquisition cost estimating is under review to determine if revisions are needed. The officials informed us that if revisions are made to the B-1B program cost estimate they prefer to include them as additions to the \$20.5 billion estimate.

We would have preferred that Defense include all applicable costs in the initial B-1B estimate when it was established. However, for various reasons they were not. What we believe is important now is to identify all the B-1B acquisition costs and provide them to the Congress in one package.

CHAPTER 7

SUMMARIES OF SELECTED MULTISERVICE

WEAPON SYSTEM REPORTS

PROGRESS OF THE LIGHT ARMORED VEHICLE

PROGRAM SHOULD BE CLOSELY MONITORED



ISSUES

*Operational requirements • Force level requirements
Affordability • Incomplete data reporting • Timeliness*

This report discusses the joint Army and Marine Corps' program development of light armored vehicles. Almost from the beginning, the Light Armored Vehicle Program has been marked by indecision as to the types of vehicles that would best suit the services' needs.

The Marine Corps' requirements for a basic light assault vehicle, mounting a 25-mm Bushmaster gun, appear to be firm but its choices of variants to this vehicle are still changing. Its version of the basic vehicle has been tested although some reliability, maintainability, and durability tests have not yet been completed. The Army's requirements for this vehicle, as well as for a companion light armored squad carrier, have fluctuated for some time. It was only this past June that some decisions were made as to the types of vehicles that should be acquired.

The Army's version of the light assault vehicle has not been tested although, because of vehicle similarities, test results of the Marine Corps vehicle should be useful in evaluating the Army's version. An important distinction between the two is a gun stabilization system the Army would like to incorporate in its vehicle to permit shooting while on the move.

The Army is about to select a contractor for a 5-year firm-fixed-price production contract scheduled to be awarded during the week of August 16, 1982, covering 969 light assault vehicles; 289 of which are designated for the Marine Corps. In addition, several variants to the light assault vehicle are to be included as options in the contract. Under these options, the Army may buy 69 recovery vehicles and the Marine Corps may purchase 297 additional vehicles which represent several types of variants to the basic assault vehicle.

The Light Armored Vehicle Program has progressed from one that was first envisioned as a low-cost acquisition of off-the-shelf vehicles to one that is potentially a \$1 billion program involving vehicles that have not previously been produced. With the choices of several variants to the basic vehicle that are still being considered for acquisition, we are concerned that the program may be reaching the level where its affordability should be questioned. We believe it is important to closely monitor this program, particularly the proposed acquisition of different types of variants to ensure that the services do not lose sight of the Congress' intent and the objectives of your office in establishing the joint program, for example, the acquisition of basically similar, low-cost vehicles.

SCOPE

We examined requirement documents, test plans, test results, and other data related to the program. Also, we held extensive discussions with the Project Manager, Light Armored Vehicles, located at the Army Tank-Automotive Command. Program data was also reviewed and interviews were held with officials at the Army and the Marine Corps Headquarters and various Army and Marine Corps test and evaluation centers.

Our review was performed in accordance with our "Standards For Audit of Governmental Organizations, Programs, Activities, and Functions."

LIGHT ARMORED VEHICLE PROGRAM

In 1980, at the urging of the Congress, the Marine Corps began a program to acquire off-the-shelf, airliftable, lightweight armored vehicles which would provide mobility, protection, and firepower in support of the rapid deployment force. The Marine Corps was to start production in 1982 and begin fielding the vehicles in 1983. In 1981 after the Army began developing its own lightweight armored vehicle requirements, the Office of the Secretary of Defense, recognizing the economic potential of the services acquiring similar vehicles, directed the Army and the Marine Corps to develop their requirements under a joint program. Unlike the Marine Corps, the Army has not set a date for beginning its vehicle deployment. The Army has considered the program a high risk because of the accelerated schedule for testing and deploying a system that is not strictly off the shelf.

Because of its experience in acquiring armored vehicles, the Army was designated as the contracting agency with overall acquisition responsibility. A joint program office was established in September 1981 at the Army Tank-Automotive Command with a Marine officer as project manager.

Request for proposals to provide competitive prototypes for testing were issued in April 1981. Seven contractors responded, one of which proposed two types of vehicles. The Army selected the following contractors for the test and evaluation phase.

<u>Contractor</u>	<u>Type</u>
General Motors of Canada	8-wheel vehicle
Cadillac Gage	6-wheel vehicle
Cadillac Gage	4-wheel vehicle
Alvis Limited (England)	Track vehicle

Although these vehicles were purported to be basically "off-the-shelf," three have been modified to some extent and a fourth represents a model not previously built, as shown below:

<u>Contractor</u>	<u>Changes from off-the-shelf design</u>
General Motors of Canada	Swiss design, not previously produced in 8-wheel version
Cadillac Gage	4-wheel vehicle stretched by 18"
Cadillac Gage	6-wheel vehicle not previously produced
Alvis Limited	Modified engine and transmission

From November 1981 through May 1982, tests and evaluations were made of four models of the Marine Corps version furnished by the three contractors. These tests were done primarily at Yuma Proving Ground, Arizona, and at Twenty-Nine Palms Marine Base and Camp Pendleton, California. A production contract for the 969 light assault vehicles is to be awarded to one of the three contractors in August 1982.

SYSTEM DESCRIPTION

The light armored vehicle, of which approximately 10 variants may ultimately be developed, is to have cross-country mobility; armor protection against small arms fire and shell fragments; high road speed; swim capability; nuclear, biological, and chemical protective capability; air transportability; and offensive firepower. Agility characteristics, such as quick acceleration and short turning radius, and mobility characteristics, such as road speed and range, are expected to enhance survivability and be compatible with the capabilities of other combat wheeled and tracked vehicles. The light armored vehicle's weight of no more than 14.5 tons will make it compatible with the lift capability of the CH-53E helicopter. It can also be carried on C-130, C-144, and C-5A aircraft.

The basic vehicle to be procured under the program is the LAV-25, a light assault vehicle whose primary weapon is to be the 25-mm Bushmaster gun. There are two versions of this vehicle. For its version, the Army is considering an optional gun stabilization system capable of an accurate shoot-on-the-move capability. Its vehicle would carry a crew of three--driver, commander, and gunner. The Marine Corps' version will carry, in addition to the crew, a minimum of six combat equipped troops. The Marine Corps does not require a gun stabilization system.

The Army is considering several variants of the basic LAV-25, including a maintenance/recovery vehicle and an electronic systems carrier. The Marine Corps also plans several variants, such as antitank, air defense, assault gun, mortar carrier, command and control, maintenance/recovery, and logistics vehicles. Only the two versions of the light assault vehicle are firm requirements to be placed under contract. The other variants may be purchased at the option of either service after prototype testing. Two prototypes for each of the five variants currently included in the proposed contract will be provided by the winning contractor.

PROGRAM UNCERTAINTIES

What was initiated as a nonmajor, low-cost, off-the-shelf vehicle program, has developed into a major program whose vehicle composition is still to be determined and that carries a potential for cost growth in view of the fluctuating requirements, decisions to be made on the variants, and testing still to be done.

Fluctuating requirements

Since the request for proposals for the production phase were issued in September 1981 to the three competing contractors, there have been numerous changes in the procurement quantities. The greatest potential impact was the fifth modification to the proposal, dated February 17, 1982. This change made the Army light armored squad carrier variant an alternative rather than a firm contract requirement, thereby reducing the quantity to be purchased by 775 vehicles. The Army's decision was complicated by the existence of two infantry planning centers with differing proposed approaches. One center at Fort Benning, Georgia, did an initial study on light armor needs and capabilities which served as the basis for establishing the Army's requirement for the Light Armored Vehicle Program. Another center at Fort Lewis, Washington, has also been studying the types of vehicles that would best meet the Army's light vehicle needs. It suggested a lighter armored vehicle of 3 to 4 tons that would be liftable by the Blackhawk helicopter. This suggestion led the Army to drop the 14.5 ton light armored squad carrier vehicle.

The Army originally scheduled a decision by June 1, 1982, on whether to include its light armored squad carrier vehicle under the same contract along with its LAV-25 requirements. When no

decision was made, the light armored squad carrier requirements were omitted from the proposed contract.

On July 9, 1982, just before the initially planned contract date of mid-July, the Marine Corps decided to defer for further study the air defense and assault gun variant vehicles. As a result of this action--another in a series of determinations and redeterminations affecting the program's acquisition profile since the program began--the project manager made a second call for best and final offers on July 16. A contract is expected to be awarded during the week of August 16.

Testing

Because the Army joined the program after the Marine Corps had already solicited proposals from industry for test vehicles, none of the possible Army configurations will be tested before contract award. For its version of the light assault vehicle, the Army will hold its own tests during the period mid-September to December 31, 1982. To accomplish this, one of the Marine Corps' configured vehicles will be shipped to the winning contractor, converted to the Army configuration, tested in this configuration, and shipped back to the contractor for return to the Marine Corps configuration.

Since the accelerated test program did not provide sufficient reliability, availability, maintainability, and durability testing, such testing will not be completed until after the production contractor is selected.

Availability of helicopters for airlifting vehicles is uncertain

While the Marine Corps was instrumental in requiring the assault vehicles to be liftable by the CH-53E helicopter, it is doubtful whether the helicopters will meet the Marine vehicle deployment schedule. Helicopters required for the first of three helicopter squadrons may not be available until 1986 or about 3 years later than the 1983 vehicle deployment date. In view of maintenance float requirements, it is also doubtful that sufficient numbers of helicopters will be available at any one time to meet the Marine Corps requirements unless the Marines procure additional helicopters over those planned.

CONCLUSIONS

Both the Army and the Marine Corps abandoned plans to procure three vehicle types that were originally a part of the contract to be awarded later this month. These changes, and the options that each service has retained to acquire differing variants of the light assault vehicle, indicate that the vehicle composition of the light armored forces is far from settled. There exists a

potential for the proliferation of vehicles and a resultant program cost growth unless the acquisition plans of the two services are reviewed periodically by your office to ensure that they are conforming to the intent of the Congress and the objectives of the joint program. As a first step, it seems appropriate to place the Light Armored Vehicle Program under the Selected Acquisition Reporting system so that the program's progress can be monitored by your office and to provide a higher visibility for the Congress.

RECOMMENDATION TO THE
SECRETARY OF DEFENSE

We recommend that the Light Armored Vehicle Program be placed under the Selected Acquisition Reporting system to ensure that its progress can be more closely followed by your office and by the Congress.

MATTERS OF CONCERN OBSERVED IN EVALUATION OF THE
ADVANCED MEDIUM RANGE AIR-TO-AIR MISSILE PROGRAM



SOURCE: DEPARTMENT OF DEFENSE

ISSUES

Operational requirements • Affordability
Adequacy of testing • Program management • Program concurrency

This letter summarizes our observations on the status of the Advanced Medium Range Air-to-Air Missile (AMRAAM) program. We are reviewing the extent to which AMRAAM is likely to satisfy Air Force and Navy performance objectives and the status and significant issues concerning this missile program. Our evaluation of the program is continuing, and we plan to issue a follow-on report later this year, if warranted.

AMRAAM is intended to replace the Sparrow system. The new missile is to be compatible with the latest Air Force and Navy fighter aircraft and be capable of operating both within and beyond visual range. AMRAAM is to be faster, more reliable, and more resistant to electronic countermeasures than Sparrow. It is also to have an active radar seeker which affords several important operational advantages. AMRAAM is being developed by the Air Force and the Navy to meet their joint operational requirements in the 1985-2005 time frame. As of November 1982, the life-cycle cost of the missile system was estimated at about \$14 billion.

GAO/MASAD-83-17
FEBRUARY 28, 1983

AMRAAM has experienced significant cost growth in the past 2 years. The program is dynamic and uncertainty surrounds what the future holds. Auditable data has been scarce to us to examine in detail until recently when the Secretary of Defense approved full-scale development. We believe the AMRAAM system has not had sufficient visibility before the Congress. Before February 1983, the Department of Defense had not prepared and furnished the Congress with Selected Acquisition Reports nor with Unit Cost Reports, called for by Public Law 97-86--December 1, 1981, and we are concerned that many relevant factors will not be evident even if the Department of Defense initiates periodic reporting later this month. Consequently, we are bringing the following information to your attentions to help identify AMRAAM program issues which merit development in the hearings your Committees will be conducting during the next several weeks.

In the course of our current review 1/ of the AMRAAM program, we have observed the following:

- Assessments and simulations made of operational usefulness during 1981 and 1982 highlighted the favorable combat attributes of AMRAAM. These studies, however, suggest that some AMRAAM-related capabilities may have only marginal usefulness in combat.
- AMRAAM technical performance remains uncertain. Validation phase ground tests and simulations and captive and guided flight tests with Air Force and Navy aircraft have provided increased assurances that some performance goals can be achieved and have identified other areas which are to be emphasized during full-scale development. Some scheduled tests, however, either were not done or were only partially completed. Consequently, some critical issues and technical characteristics have not been fully demonstrated. Demonstration of the missile's total performance will not be possible until after the planned November 1984 production commitments because the final increment of software will not be available until May 1985.
- Full-scale development testing is scheduled to continue well beyond the initial commitment to production. The validation phase schedule

1/We have twice reported on previous reviews of the AMRAAM program: "Progress and Problems of the Advanced Medium Range Air-to-Air Missile Program" (C-MASAD-81-6, February 23, 1981) and "Effectiveness of the Advanced Medium Range Air-to-Air Missile Is Uncertain" (C-MASAD-81-17, August 4, 1981).

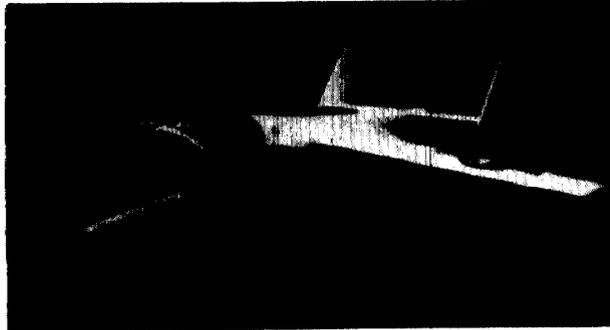
proved to be unrealistic, and the full-scale development schedule seems to be no less ambitious.

--A July 1982 estimate shows AMRAAM's acquisition cost has more than tripled since concept validation began 3-1/2 years ago, and this does not include known elements which could add substantially to acquisition costs. While we have not examined the details, a November 1982 Secretary of Defense estimate shows that the program's life-cycle cost may approach \$14 billion.

AIR FORCE AND NAVY TRAINER
AIRCRAFT ACQUISITION PROGRAMS



T-45



T-46A

ISSUES

*Operational requirements • Affordability • Technical risk
Program management • Program concurrency*

The Navy and the Air Force have proposed three programs to acquire 1,184 trainer aircraft at a cost of about \$10.8 billion during the next 20 to 25 years. They are the Navy's proposed T-45 aircraft for its Undergraduate Flight Training System, the Air Force's T-46A Next Generation Trainer, and the Air Force's Tanker-Transport-Bomber Training System aircraft. The T-45 will replace the Navy's T-2B/C intermediate and TA-4J advanced jet trainers. The T-46A will replace the Air Force's aging T-37 basic jet trainers. The Tanker-Transport-Bomber Training System will be a multiengine jet trainer used to introduce student pilots to multiengine aircraft flying.

GAO reviewed the proposed programs to provide the Congress with information on the status and significant issues of these programs.

GAO/MASAD-83-22
JULY 5, 1983

CONGRESSIONAL CONCERN

The Congress has expressed skepticism about these programs and has taken the following actions:

- In August 1982, the House and Senate Armed Services Committees' conferees expressed concern over the proliferation of military aircraft production lines.
- Last year, the Congress did not authorize any appropriations for the Tanker-Transport-Bomber Training System despite Air Force plans to begin.
- While 1983 funds were appropriated to continue development of the T-45 and the T-46A, the House and Senate Armed Services Committees' conferees expressly reserved judgment about authorizing any production. They said they would reserve judgment until the Secretary of Defense presents the Congress with a comprehensive plan which persuasively establishes the administration's ability to fund these aircraft without diverting resources from existing production lines.

T-45

The T-45 is a two-tandem seat, jet engine trainer designed and built in Britain. A version will be built for the Navy in this country by McDonnell Douglas Corporation and will possess added capability enabling it to operate from aircraft carrier decks.

Pre full-scale development of the Navy's T-45 began in September 1982. Full-scale development is planned to begin about March 1984, but this will probably be delayed because the Navy was late in starting its pre full-scale development phase. A review of the acquisition program by the Defense Systems Acquisition Review Council was planned in 1982 but was postponed twice. The Navy is still involved in internal review of the program and a new date for the Council's review has not been set.

The Navy originally planned to buy 282 aircraft, all of which would have been capable of operating from aircraft carriers. To reduce costs in the early program years, it subsequently proposed to buy a mixed fleet of 305 aircraft (plus 2 development models), of which 251 would be carrier capable. Contractor studies show that a mixed aircraft fleet is feasible but may be more costly. As of April 1983, the Navy had not decided on the structure of the program and had no cost estimate for the mixed fleet alternative that was satisfactory for budget purposes.

The Navy might be able to avoid buying a mixed fleet of T-45 aircraft, thus possibly reducing the cost of the program. Under the mixed fleet plan, the Navy would purchase the noncarrier-capable T-45s starting in 1987 to replace TA-4Js. But, the Navy will not need any carrier-capable T-45s to replace T-2B/Cs until 1990. While a shortfall of TA-4Js is projected to develop in 1987, this could be avoided by modifying and transferring TA-4Js from lower priority training programs. This would allow the Navy to wait until 1990 for the carrier-capable T-45s and avoid procurement of noncarrier-capable T-45s. GAO believes the Navy needs to examine this alternative.

The House Appropriations Committee, in its fiscal year 1980 report, stressed the desirability of having training aircraft that can meet the needs of both the Navy and the Air Force. However, there is little likelihood that the Air Force will procure any T-45 aircraft because it sees no need to replace its present T-38 aircraft used for advanced pilot training within the next 10 to 15 years. Further, the T-45 does not meet the Air Force's performance requirements.

Public Law 97-252 requires submission to the Congress of periodic reports on major weapon system acquisition programs. No periodic reports on the status of the T-45 program have been presented to the Congress. The Secretary of Defense requested a waiver on submitting Selected Acquisition Reports on the T-45 program; however, the waiver was denied. A Department of Defense official told GAO that they expect to begin reporting as of September 30, 1983.

RECOMMENDATIONS TO THE
SECRETARY OF DEFENSE

GAO recommends that the Secretary of Defense direct the Secretary of the Navy to consider extending the use of existing TA-4J aircraft in lieu of procuring the T-45s that are not capable of operating from aircraft carriers. This would permit delaying acquisition of the T-45 until a carrier capable version could be made available. This would eliminate a need to acquire a mixed fleet of aircraft.

GAO also recommends that the Secretary of Defense direct the Navy to develop a firm program plan which discloses the uncertainties, risk, and judgment factors involved in determining the quantity of T-45 aircraft to be procured, the procurement schedule, and funding requirements.

T-46A

In 1982 the Air Force awarded contracts for full-scale development of the T-46A; the contracts also contain options for initial production units.

Compared to the T-37, the T-46A is expected to have increased performance, improved maintainability, reduced fuel consumption, lower operating costs, and improved capability to operate in certain adverse weather conditions.

The latest cost estimate available at the time of GAO's review was made in June 1982. Between July 1981 and June 1982, the estimated program costs increased \$164 million from \$3.277 billion to \$3.441 billion, or 5 percent. This increase occurred primarily because higher escalation indices were used to project the effect of inflation on costs and the production schedule was stretched to reduce fiscal year 1984 funding requirements. The \$164 million cost increase would have been about \$82 million higher, but the Air Force transferred aircraft simulator development to another program, deleted one development aircraft, and canceled plans for one phase of engine testing. Some other potential future Air Force costs for interim contractor support and engine component improvement were not included in the cost estimate.

The President's budget request for the T-46A submitted to the Congress in January 1983 shows the latest program cost estimate as \$3.45 billion. GAO did not analyze this new estimate.

The Air Force plans to develop a new engine in parallel with the T-46A airframe by adopting the technology of an existing, but larger commercial engine. The performance demanded of this engine will be high. Despite the relatively short development time being allowed, Air Force officials are confident of success. In 1980, a GAO review of management problems in aircraft gas turbine engine programs determined that experience has shown that such efforts have not been trouble free. This report shows that adequate development time for modified engines requires 5 to 7 years as opposed to the 33 months allowed for the T-46A engine development.

The aircraft program schedule provides for considerable overlap between development and production. Twenty-six production aircraft are due to be delivered before flight testing is complete. Any delay in the development schedule or problems identified in the flight test program could result in the need to make changes in the aircraft or its engine after production is underway.

The Navy has no interest in acquiring the T-46A because it sees no need to replace its much less expensive primary trainer aircraft, the T-34C, at this time.

The Department of Defense expects to begin submitting Selected Acquisition Reports to the Congress on the status of the T-46A program as of June 30, 1983.

TANKER-TRANSPORT-BOMBER TRAINING SYSTEM

The Air Force plans to use the Tanker-Transport-Bomber Training System to train advanced student pilots in multiengine aircraft. The Air Force presently does not have multiengine training capability for the undergraduate student pilot. Air Force officials approved this specialized pilot training concept in June 1980 and the Mission Element Need Statement in September 1981. The Air Force expects to procure off-the-shelf,

twin-engine aircraft to train tanker, transport, and bomber aircraft students during the second phase of their flight training. Use of this aircraft could reduce training cost and delay the need to replace T-38 trainers.

The Air Force planned to begin development in fiscal year 1983, but the Congress did not authorize appropriations for the program in that year. The Air Force renewed its initiative by requesting fiscal year 1984 funds.

The Air Force changed the year it expects to begin using the aircraft from 1986 to 1988 because an analysis showed that the new aircraft would not be needed until 1988.

AGENCY COMMENTS

The Department of Defense reviewed a draft of this report and provided GAO with official oral comments. The Department's spokesperson said that in general the Department had no substantial dispute with the facts and conclusions stated in the draft. However, as considered appropriate, GAO has made some minor changes as suggested by spokespersons for the Department of the Navy. Defense spokespersons did not specifically state agreement or disagreement with GAO's recommendations.

LISTING OF OTHER RELATED REPORTSISSUED FROM APRIL 1, 1982, THROUGH JUNE 30, 1983

<u>Title</u>	<u>Number</u>	<u>Date</u>
Progress Made by AH-64 Helicopter Contractors in Preparing for High Rate Production	GAO/NSIAD-83-4	June 27, 1983
Better Planning and Management of Threat Simulators and Aerial Targets Is Crucial to Effective Weapon Systems Performance	GAO/MASAD-83-27	June 23, 1983
Status of Trident and SSN-688 Submarine Construction at the Electric Boat Division of General Dynamics Corporation	GAO/MASAD-83-10	Feb. 28, 1983
Issues Concerning the Defense Department's Global Positioning Systems as It Enters Production	GAO/MASAD-83-9	Jan. 26, 1983
Cost Information Presented to the Congress on the C-5B Aircraft Program	GAO/MASAD-83-5	Dec. 30, 1982
Several European Theater C ³ Programs Require Continued Management Attention	GAO/C-MASAD-83-2	Dec. 13, 1982
Acquisition Strategy for the Services Joint Tactical Fusion Program	GAO/C-MASAD-83-4	Dec. 3, 1982
Costs and Benefits of a Common Strategic Rotary Launcher Should Be Reassessed Before Further Funds Are Obligated	GAO/MASAD-83-3	Nov. 15, 1982
An Analysis of the Counterair Mission Is Required to Help Ensure that the Air Force Is Buying the Capabilities It Needs	GAO/MASAD-83-1	Nov. 5, 1982

<u>Title</u>	<u>Number</u>	<u>Date</u>
Information on B-747 and C-5B Aircraft Cost Comparisons	GAO/MASAD-82-48	Sept. 21, 1982
Information Regarding Trident II (D-5) Missile Configured Submarine Cost and Schedule	GAO/MASAD-82-47	Sept. 3, 1982
The Antiarmor Cluster Munition Program Should Be Terminated	GAO/C-MASAD-82-22	Aug. 24, 1982
Deficiencies Identified with an Urban Warfare Modeling Program at the TRADOC Systems Analysis Activity	GAO/MASAD-82-46	Aug. 20, 1982
Much Remains to Be Done to Minimize Tactical Communica- tions Vulnerability to Electronic Warfare	GAO/C-MASAD-82-18	Aug. 17, 1982
Procurement, Modification, and Utilization of the OH-58 Helicopter	GAO/MASAD-82-44	Aug. 12, 1982
GAO Position on Several Issues Pertaining to Air Force Consolidated Space Operations Center Development	GAO/MASAD-82-45	Aug. 12, 1982
Testing and Maintenance of Weapon Systems May Be Enhanced by the Design for Testability Concept	GAO/MASAD-82-38	Aug. 6, 1982
Procurement of the AH-64 Helicopter	GAO/MASAD-82-40	Aug. 3, 1982
Lack of Cooperation Precludes Navy and Air Force from Developing Common Radar Warning Receivers	GAO/C-MASAD-82-38	June 11, 1982

<u>Title</u>	<u>Number</u>	<u>Date</u>
Evaluation of NASA's Fiscal Year 1983 Funding Request to Determine How Much Supports DOD Programs	MASAD-82-33	Apr. 26, 1982
Self-Protection Jammers for Tactical Aircraft--More Effective Solutions Needed	C-MASAD-82-16	Apr. 22, 1982
Status of Major Acquisitions as of September 30, 1981: Better Reporting Essential to Management Oversight	MASAD-82-24	Apr. 22, 1982
B-1 Bomber Program Baseline Cost	MASAD-82-32	Apr. 19, 1982
Cost Growth and Delivery Delays in Submarine Construction at Electric Boat Are Likely to Continue	MASAD-82-29	Apr. 19, 1982
Opportunities to Reduce the Cost of Some B-52 Modifications	MASAD-82-30	Apr. 9, 1982
Need to Reexamine JTIDS Requirements and Architecture	MASAD-82-28	Apr. 2, 1982

LISTING OF SUMMARY REPORTS ON MAJOR WEAPON SYSTEMSISSUED IN PREVIOUS YEARS

<u>Title</u>	<u>Number</u>	<u>Date</u>
Improving the Effectiveness and Acquisition Management of Selected Weapon Systems: A Summary of Major Issues and Recommended Actions	GAO/MASAD-82-34	May 14, 1982
Acquiring Weapon Systems in a Period of Rising Expenditures: Implications for Defense Management	MASAD-81-26	May 14, 1981
Issues Identified in 21 Recently Published Major Weapon System Reports	PSAD-80-43	June 12, 1980
Digests of Major Weapon System Reports Issued January and February 1979	PSAD-79-64	Apr. 25, 1979

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